Environmental Property Assessment

Soil and Groundwater Investigation

Lots 17 and 18
Milwaukee Road
Depot Site

Prepared for
Minneapolis Community Development Agency

May 1993

Environmental Property Assessment
Soil and Groundwater Investigation
Lots 17 and 18 of Former
Milwaukee Road Depot Site
Minneapolis, Minnesota

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Section I
Executive Summary

In the fall of 1992, the Minneapolis Community Development Agency authorized Wenck Associates, Inc. to perform a soil and groundwater investigation at Lots 17 and 18 of the former Milwaukee Road Depot site, which the Agency owns, in downtown Minneapolis. The scope of work included site surveying, soil borings, monitoring well installation, soil and groundwater sampling, data interpretation, and preparation of a report summarizing these activities along with recommendations for possible corrective action. Drilling and laboratory services were subcontracted separately. The former railroad right-of-way, which is privately owned, separates the two lots and was not included in this investigation.

The geotechnical investigation found 3 to 9 feet of fill across the site (18,000 cubic yards, not including the right-of-way). The fill consists mainly of coal ash, sand, and some construction debris. This is underlain by native soil to a depth of approximately 10 to 27 feet. The native soil is primarily a fine- to medium-sand, but a thick clay layer lies beneath the sand in the southwest and northeast portions of the site. The Platteville limestone encountered in the bedrock at an approximate depth of 32 feet. No groundwater was encountered above the bedrock.

Groundwater under the site appears to be free of pollution impacts, based on the analysis for EPA's 127 Priority Pollutants in a sample from a monitoring well installed on Lot 17. Similarly, the underlying native soil at the site was found to be virtually free of contaminants.

Significant concentrations of polynuclear aromatic hydrocarbons (PAHs) occur throughout the fill on the site. Total PAHs ranged from 1 to 147 milligrams per kilogram; total carcinogenic PAHs ranged from not detected to 53 milligrams per kilogram. Also, the

concentration of lead at one location in the fill exceeded 300 milligrams per kilogram, the level established by the Minnesota Department of Health as a criterion for residential sites. Therefore, if Lots 17 and 18 are not to be restricted from future residential development, at least a portion of the fill would eventually require remedial action.

At present the site poses no significant human health risks because it is capped with asphalt. The site could safely remain in its present condition indefinitely. However, if it is to be developed for new uses, the Minnesota Pollution Control Agency may require remediation of some or all of the fill. In this case a practical remedy would be to excavate the fill and deposit it in an appropriately permitted landfill. The estimated cost for this is approximately $75 per cubic yard. This cost would include excavation, hauling, and the tipping fee at a local landfill, south of the Twin Cities. It does not include the cost of clean fill to replace the excavated material.

Section II
Introduction

A. PURPOSE AND SCOPE

This report presents the results of a soil and groundwater investigation performed on property owned by the Minneapolis Community Development Agency (MCDA) at Lots 17 and 18 of the former Milwaukee Road Depot. The purpose of the work was to characterize soil contamination at the site, and to determine if groundwater contamination exists below the site. Based on this characterization of soil and groundwater contamination feasible corrective actions were then to be developed, together with estimated costs. The MCDA intends to sell this property for development, and needs to know how to clean the site to acceptable levels for development, and how much this cleanup will cost.

The MCDA authorized Wenck Associates, Inc. in the fall of 1992 to produce a work plan, contract necessary services, observe field activities, conduct environmental sampling and surveying, and produce a report summarizing these activities, along with recommendations and cost estimates for corrective action. The scope of work in this investigation is based upon the document entitled "Environmental Property Assessment Work Plan" (Wenck, 1992). Field procedures presented in this work plan were strictly followed except as noted.

B. FIELD INVESTIGATION

Environmental Technology, Inc. of Minneapolis, Minnesota, installed 14 soil borings to various depths on Lots 17 and 18 and one monitoring well in the northeast corner of Lot 17 under the direction of Wenck during the period February 18 through 25, 1993. Wenck Associates collected 24 soil samples for analysis during this period, and was also responsible for well development and surveying. Wenck personnel sampled the groundwater monitoring well on March 8, 1993.

Section III
Site Background

A. LOCATION

Lots 17 and 18 are located in downtown Minneapolis between Third Avenue South and Fifth Avenue South, and are bordered on the south by Second Street South (see Figure 1). The lots are approximately 1.3 acres and 1.1 acres in size, respectively, and are separated by the former Milwaukee and St. Louis Railroad right-of-way (ROW), which is now privately owned (Figure 2). This parcel was not included in this investigation because of difficulties in obtaining legal access.

B. SITE HISTORY

The Chicago Milwaukee & St. Paul Railroad (later the Chicago Milwaukee & St. Paul & Pacific Railroad) began using the Milwaukee Road Depot site, of which Lots 17 and 18 are a part in the 1880's. The property had a main station, grain elevator, and at least three warehouses on it during the early 1900's. More recently, Consolidated Freightways Motorfreight Station occupied one of the former warehouses, and an automobile repair garage was operated on the site (PACE, April 1989). Currently, Lots 17 and 18 and the ROW are covered with asphalt and used as a parking lot.

The MCDA purchased the former depot site in 1992 from the Resolution Trust Corporation, which had succeeded Gibraltar Savings of Van Nuys, California, in ownership of the property.

C. PREVIOUS SITE INVESTIGATIONS

Several investigations have been conducted at the Milwaukee Road Depot site in the recent past. None of the investigations focused solely on Lots 17 and 18, but most of them did some work on these two lots. Pertinent field and analytical findings from these studies are summarized in Table 1, with previous soil boring locations shown on Figure 2.

1. October 1986 - Study for Ellerbe Associates

A preliminary foundation investigation of the Depot site was done for Ellerbe Associates by Braun Engineering Testing (1986). Twelve soil borings were installed to determine the depth to bedrock and subsoil engineering properties. One of these borings was on Lot 17 and one on Lot 18.

This foundation investigation revealed that contaminated soils probably existed within the Depot site, as three borings (not on Lots 17 or 18, but one placed only one block southwest of Lot 17) encountered soils smelling of petroleum at varying depths, but mostly just above the bedrock.

2. April 1989 - Study for Gibraltar Savings

On behalf of Gibraltar Savings of Van Nuys, California, a preliminary site assessment was performed by PACE Laboratories, Inc. (April 1989) to determine the subsurface contamination potential and the need for any subsurface monitoring. It was found that soil contaminated with petroleum was present on the Depot property, and that creosote contamination of the site (from railroad ties) on Lots 17 and 18 was possible. The assessment also noted that Lot 18 had an automobile repair garage in the past, which might have contributed to subsurface contamination. The site assessment finished with recommendations for further investigation of the depot site.

3. July 1989 - Study for Gibraltar Savings

This investigation (PACE, July 1989) was performed as a follow-up to the preliminary site assessment. It was intended to further define the previously detected fuel oil contamination, and to determine if other contaminants, such as wood treatment chemicals, solvents, and polychlorinated biphenyls (PCBs) were present. Soil contamination was suspected due to the large number of railroad ties formerly stored on the property, the operation of a former automobile repair shop on Lot 18, and the former common practice of applying oil (possibly contaminated with PCBs) over open land to control dust.

Fifteen soil borings were drilled within the depot site to observe subsurface conditions and collect samples for analysis. These included three borings on Lot 18 and two on Lot 17 advanced to a depth of 7 feet. Samples from the borings were composited and analyzed.

No evidence of volatile organic compounds (VOCs) was detected in the soil samples analyzed in the laboratory, or during on-site headspace screening of samples from the individual borings from Lot 18. Polynuclear aromatic hydrocarbons (PAHs) were found in samples taken from both lots.

4. February 1991 - Study for Gibraltar Savings

This investigation was performed to supplement the previous study results and to provide sufficient site data for review by the MPCA as to the need for site cleanup work (PACE, February 1991). It was specifically aimed at determining the extent of PAH contamination in soil and groundwater, and the extent of free-phase fuel oil. Free-phase fuel oil was found in previous investigations beneath portions of the Depot site, though not on Lots 17 or 18.

The work on Lots 17 and 18 consisted of drilling three soil borings to bedrock, excavating three trenches to six feet to sample fill material, attempting construction of two monitoring wells, and production of bedrock topographic profiles via seismic refraction.

The monitoring wells were not constructed because groundwater was not encountered. The report notes that no petroleum odors were detected during drilling. The seismic report delineated bedrock topography and indicated the presence of two bedrock depressions (with free-phase fuel oil) beneath the Depot site, neither of which is below Lots 17 or 18. According to the report, the possibility exists that the two depressions may be hydraulically connected by a bedrock low that was not detected by the seismic refraction. Bedrock topography was determined to control the flow of groundwater. In areas where bedrock rises above the 803 to 804 foot elevation, apparently the case for Lots 17 and 18, groundwater flow within the surficial soil was not found.

The geology, as described in the report, consists of bedrock (Platteville limestone) averaging approximately 30 feet thick, overlain with a brown, fine to coarse native sand varying up to 25 feet in thickness, with some silts and gravels, and five to ten feet of black fill material over the sand. A portion of the fill was reported to be a coal ash/clinker material.

Trench soil sampling was conducted to obtain representative soil PAH concentrations as a comparison to previous results. No railroad ties were encountered during the trench sampling and the analytical results were considered representative of area soils. Total PAH concentrations ranged to a maximum of 5.98 milligrams per kilogram (mg/kg).

From the soil sampling results, PACE concluded that PAH compounds are present in the shallow fill material across the site, but apparently not in the underlying native soils. The source of the PAH compounds appeared to be buried creosote-treated railroad ties and the coal ash/clinker fill material. Due to the relative immobility of the PAH compounds and the lack of significant infiltration (beneath an asphalt parking lot), the PAH compounds appeared to be contained within the fill material.

Remedial actions for the site were also considered. The conclusion reached was that removal of railroad ties and coal ash/clinker material would be sufficient remediation for the PAH

contamination in Lots 17 and 18. Removal of free-phase fuel oil and fuel oil-contaminated soils beneath other portions of the Depot site were recommended (Tellus, November 1989).

5. September 1992 - Study for MCDA

The most recent investigation of the Milwaukee Road Depot site was conducted by Delta Environmental Consultants, Inc. for MCDA (Delta, September 1992). Their investigation covered only the areas south of Lots 17 and 18, between Second Street South and Washington Avenue South, and between Third Avenue South and Chicago Avenue South. It was concluded that soil contamination and free-phase No. 2 fuel oil exist on the property just south of Lots 17 and 18, that groundwater flow is generally to the northeast, and that dissolved petroleum contamination exists in some of the monitoring wells near the site.

Section IV
Field Activities

A. SOIL BORINGS

Fourteen soil borings were installed at the site (see Figure 2) to obtain the following information:

1) Soil stratigraphy;
2) Depth and visual characteristics of the fill material;
3) Composite samples of the fill material for chemical analysis;
4) Discrete samples of native soil beneath the fill for chemical analysis; and
5) Depth to bedrock and groundwater beneath the site.

The borings were installed by Environmental Technology, Inc. of Minneapolis, Minnesota, using hollow-stem auger (HSA) drilling techniques. Standard penetration tests were conducted, and 2-foot split-spoon samples were collected continuously, according to ASTM Method D1586 "Penetration Test and Split Barrel Sampling of Soils," except in the upper zones where the soil was frozen. Above the frost line, soil samples were obtained by advancing the auger in 6-inch or 1-foot increments, removing it from the borehole, and then collecting the soil from the HSA for classification and analysis. Table 2 shows the sampling intervals. Upon completion, all boreholes (except B-11 in which a well was installed) were abandoned using cuttings and bentonite chips (Enviroplug No. 8). All soil samples were field classified by the Wenck engineer according to ASTM D2487, "Unified Soil Classification System" and ASTM D2488, "Recommended Practice for Visual and Manual Description of Soils." Boring logs are given in Appendix A.

For collection of composite samples of the fill, the fill material was placed in a decontaminated stainless steel or plastic bowl, and then mixed with other fill samples from within the same boring. In addition, fill material was placed in one-pint glass jars for jar-headspace analyses. When sampling of fill material was completed, the composite was hand mixed (homogenized), placed into three clean, glass sample jars, labeled, and taken to the laboratory for analysis.

Discrete soil samples were collected directly from the split-spoon sampler and placed into three labeled, clean, glass sample jars supplied by Spectrum Laboratories. Additional material from the split-spoon was placed in one-pint glass jars for jar-headspace analysis.

Of the three sample jars submitted to Spectrum Laboratories for analysis, one was analyzed for metals, one for semivolatiles, and one was stored at Spectrum for possible future analyses. The parameters analyzed for are presented in Table 3 and discussed in Section C below.

Decontamination of the split-spoon sampler consisted of the following steps:

1) Brushing to remove gross contamination;
2) Trisodium phosphate wash; and
3) Water rinse.

A high-pressure, hot water ("steam cleaning") wash was used for decontaminating the augers and all down-hole equipment between borings.

B. MONITORING WELL INSTALLATION AND DEVELOPMENT

Borehole B-11 was used to install a monitoring well in the northeast corner of Lot 17 (see Figure 2). According to previous reports, this is the downgradient portion of the site and

allows for the well to be used for screening of groundwater contamination. If contamination is not found in this well, it is unlikely to exist on-site. The initial borehole was advanced 27 feet to bedrock using procedures explained in the previous section. At refusal, the driller installed 8-inch steel, temporary casing and converted to "NX" rock coring techniques, using a 2-inch core barrel with water injection (for cooling of the core bit), to drill into the bedrock. Two 5-foot core samples were retrieved, but the cavernous nature (solution cavities and fractures) of the limestone bedrock necessitated a change in drilling techniques below this because of lost circulation. Injected water was lost as quickly as it was injected into the formation, and thus not allowing proper cooling of the bit. Therefore, a 6-inch diameter roller bit was used to ream the upper 10 feet of rock to 6 inches in diameter and to drill the next 4.5 feet of bedrock. Total depth of the well borehole is 41.5 feet, with water first encountered at 40 feet. This water was under pressure and quickly rose to a static head of approximately 32 feet below grade. Compressed air was injected during advancement of the roller bit to remove rock fragments and dust, and to purge the well of accumulated water upon completion of drilling.

The monitoring well was constructed in the borehole using 2-inch inside diameter, 0.010-inch slot size, Johnson stainless steel screen, connected to a 2-inch I.D. low carbon steel riser. Clean, washed filter pack (Red Flint No. 30) was installed around the well screen to approximately 0.8 feet above the top of the screen. A bentonite seal, approximately 2.5 feet thick, was installed above the filter pack using Enviroplug No. 8, and the remaining annular space was filled with neat cement to the ground surface. Protective finishing measures include an at-grade concrete pad (since it is in a parking lot), 8-inch protective casing and cover, and locked monitoring well cap. Details of the well construction are shown in Figure 3.

The well was developed using a Grundfos™ Redi-Flo 2, 2-horsepower submersible pump. Approximately 1,000 gallons of water were removed and discharged to the storm sewer (with MPCA approval). This was done in an attempt to remove the water injected during drilling and coring.

C. ANALYTICAL PROGRAM

1. Soils

One composited soil sample of the fill material and one discrete sample of the native material from each boring (Table 2) were submitted to Spectrum Laboratories, Inc. In addition, two duplicate samples, one matrix spike sample, and one matrix spike duplicate were submitted for quality control purposes. One of the duplicate samples was analyzed by Aspen Research Corporation for comparison to the Spectrum Laboratories results.

The soil samples were analyzed for semivolatile organic compounds (SVOCs) by EPA Method 8270, and the eight RCRA (Resource Conservation and Recovery Act) metals plus boron. Table 3 lists all the analytical parameters. This list was based on the presence of coal ash (thus the metals and boron) and previous investigations which showed that PAHs, a subclass of SVOCs, were present in the fill material. Boron and the eight RCRA metals were analyzed using various methods. The elements and their corresponding EPA standard method are arsenic (7060); barium, cadmium, chromium, lead, silver, and boron (6010); mercury (7471); and selenium (7740). Table 4 lists detected SVOC concentrations and Table 5 lists the results of all metal analyses. The complete analytical report for soils is included as Appendix B.

Toxicity Characteristic Leaching Procedure (TCLP) testing for lead was performed on the three samples of fill material from borings B-2, B-9, and B-12 after the initial analyses showed elevated concentrations of lead. This was done to determine whether the fill would be classified as "hazardous." Results of these analyses are shown in Appendix B.

2. Groundwater

The groundwater sample was analyzed for total petroleum hydrocarbons and the EPA's Priority Pollutant list, which includes 127 compounds. The five groups are volatile organic compounds (VOCs), SVOCs and PAHs, pesticides, PCBs, and metals (total). The compound group and associated EPA standard method are VOCs (601/602); SVOCs and PAHs (8270); pesticides and PCBs (625); and metals (varies). The complete analytical report is included as Appendix C.

Section V
Geology and Hydrogeology

A. REGIONAL GEOLOGY

1. Surficial

The surficial geology along the Mississippi River consists mainly of terrace deposits comprised of sand, gravelly sand, and loamy sand, overlain by thin deposits of silt, loam, or organic sediments (MGS, 1989). In heavily developed areas, these deposits are overlain by artificial fill.

2. Bedrock

At various locations within the Twin Cities, the Mississippi River contacts the Platteville and Glenwood, St. Peter, and Prairie du Chien bedrock formations.

The Platteville Limestone consists of fine-grained limestone, containing thin shale partings near the top and base. The Glenwood underlies the Platteville and consists of a thin, green, sandy shale. The St. Peter Sandstone is a fine to medium-grained, friable quartz sandstone. The lower part contains multi-colored beds of mudstone, siltstone, and shale with interbedded very coarse sandstone. The Prairie du Chien is a karsted dolostone with a sandy upper half containing minor amounts of shale, and a less sandy lower half.

B. SITE GEOLOGY

The study area varies in elevation from approximately 834 from feet (above the National Geodetic Vertical Datum, approximately mean sea level) in the northwest corner of Lot 18 to 824 feet in the northeast corner of Lot 17. Across the site, the surficial soil horizon consists of fill material varying from 3 to 9 feet in depth. The fill is underlain by fine to medium sand, with occasional traces to some silt, clay, or gravel incorporated. A few lenses of silty sand were also found within this unit. In the northeast portion of Lot 17, a layer of peat and silt was identified immediately beneath the fill (B-11), and the fine to medium sand unit was observed below the peat and silt. In the northeast (near B-11) and southwest portions of the site (near B-4), a layer of gray, stiff, lean clay was found beneath the sand unit. Platteville limestone was found beneath the unconsolidated sediments at varying depths between 10 and 27 feet.

The 14 soil borings installed at the site were used to construct two geologic cross-sections illustrating site stratigraphy. The cross-section locations are shown in Figure 4, while the cross-sections are shown in Figures 5 and 6.

Fill Unit

The fill consists primarily of an ash material, assumed to be residue from the incineration of coal. Occurring with the ash are varying amounts of sands, silts, and clays (listed in decreasing order of quantity). In some locations the sand grains appeared to have an oxidized coating (yellowish), creating a dull appearance. Small amounts ("traces") of debris (i.e., brick, asphalt, gravel, railroad ties, etc.) were incorporated in the fill in some areas. The fill on the western portion of Lot 18 appeared dryer than the rest of the site to the east, and consequently was less cohesive.

The depth of fill found at the site has been contoured on Figure 8. Note that the figure shows estimated depth of fill beneath the railroad ROW, but these are based strictly on borings placed outside the ROW. No borings were placed in the ROW because legal access could not be obtained. Depth of fill beneath the ROW may not be consistent with depth of fill on Lots 17 and 18 adjacent to it. The fill history at these sites is unknown, and the ROW may have been filled for railroad construction prior to or later than, the adjacent lots. Similarly, any fill composition descriptions and testing done for this investigation do not apply to the railroad ROW, since the fill may be derived from an entirely different source than the fill on the adjacent lots.

As Figure 8 shows, Lot 18 has 3 to 5 feet of fill. It is thickest to the west, and gradually thins to the east. Lot 17, on the other hand, has 3.5 to 8.5 feet of fill, and has the deepest fill in the center of the lot. An estimated volume of fill is 21,000 cubic yards, including the estimated depth of fill beneath the railroad ROW. When this area is subtracted out, Lots 17 and 18 have an estimated 18,000 cubic yards of fill. This estimated volume was verified by using the Theissen Polygon Method to independently calculate the volume of fill (Figure 9). In this method, the area is subdivided into polygons centered around the individual borings, with every point within that polygon lying closer to that boring than any other boring. The area of the polygon times the depth of fill from that polygon's boring is the volume of fill within that polygon.

Sand Unit

The sand unit found beneath the fill was usually light brown to brown in color. Although heterogeneous across the site, typically the sand had a fine to medium gradation with thin layers of coarse sand found in a few borings. Varying amounts of silt, clay, or gravel were often present, but the sand was typically fairly "clean." The sand unit is first encountered at depths of 3 to 9 feet below

grade. It was completely penetrated at the four locations (B-2, B-4, B-9, and B-11) which were checking potential contamination on top of the bedrock. The sand unit ranged in thickness from 4.5 to 16 feet. It was thinnest at B-2, where bedrock was encountered closest to the surface, and deepest at B-4.

Clay Unit

The discontinuous, gray clay layer found above bedrock in the southwest portion of Lot 18 and the northeast corner of Lot 17 was characterized as moist, stiff to very stiff, and with high plasticity. Some interbedded layers of sandy clay and sand were observed within the clay. This unit was 8 feet thick at B-4 (southwest part of the site) and 8.5 feet thick at B-11 (MW-1).

Bedrock

The uppermost bedrock unit at the site is the Platteville limestone with a previously reported top surface elevation of approximately 798 feet to 805 feet. However, B-2 in this investigation (northwest corner of Lot 18) encountered auger refusal at 10 feet below grade, or 824 feet. To verify this, an additional boring was advanced 10 feet south of the original boring and refusal occurred at 13 feet, or 821 feet. The remainder of the borings advanced to bedrock encountered its top surface at depths of 22 feet (B-9) and 27 feet (B-4 and B-11). Elevations of the top of bedrock were thus ranging from 798 to 805 feet in these three borings, similar to what was found in previous investigations.

In the northeast corner of Lot 17, 2-inch rock coring was performed during installation of the monitoring well (MW-1, or boring B-11) to determine physical properties of the Platteville Limestone and to check for visible signs of contamination, as well as monitoring of the bedrock core with an OVM. Analysis of the core sample retrieved showed extensive fractures in the top 3

feet. Below this, the rock had increased competence and less fracturing. Rock quality designation was 47 and 62 percent for the 0 to 5 feet and 5 to 10 feet zones, respectively. No visible signs of contamination were found, nor were organic vapors found in the bedrock.

C. SITE HYDROGEOLOGY

Groundwater was not observed in the fill or sand unit above the Platteville limestone beneath the site. Previous seismic studies and drilling showed the bedrock beneath the site to represent a "bedrock high," with no water table above it. This was confirmed by this investigation. During rock coring in the northeast corner of Lot 17 for installing of the monitoring well, water was first detected at approximately 13 feet of depth into the Platteville, or approximately 784 feet. Static elevation, however, was 793.40 feet prior to sampling of the groundwater on March 8, 1993. This suggests the groundwater is either under a confining pressure, or is under water table conditions with fracture flow, and no significant connected fractures (to the water table) were encountered until 13 feet into the rock.

Groundwater flow is assumed to be controlled by the Mississippi River located approximately 400 feet northeast. The site's proximity to St. Anthony Falls makes it difficult to estimate a controlling water elevation, however, since according to the U.S. Geological Survey quadrangle map for the area, the Falls' pool elevation is 799 feet, and below the Falls, the Mississippi River's elevation is 750 feet. A single well placed on this site does not allow a flow direction determination, but evaluation of well elevations in previous reports done for the Depot site to the south suggests that flow is towards the river. However, it is possible in response to flow in the bedrock around the dam at St. Anthony Falls, that local flow directions could be away from the river beneath this site. This could not be determined from this study.

Section VI
Analytical Results

A. FIELD AND LABORATORY RESULTS FOR SOIL SAMPLES

Analytical results for the soil sampling program include field headspace screening results, presented in the boring logs in Appendix A, and laboratory semivolatile and metals analyses summarized in Tables 4 and 5, respectively, and presented in their entirety in Appendix B.

1. Headspace Screening

Trace concentrations of volatile organic compounds (VOCs), as evidenced by jar headspace screening with an organic vapor monitor, were detected in fill material in all 12 borings. No VOCs were found in the underlying native soils.

VOC readings were nearly all from the upper 3 feet of fill and were highest in the uppermost sample below the asphalt, which evidently traps vapors beneath it. The maximum reading of 9.3 parts per million (ppm) was detected in B-7a, but when B-7b was drilled a few feet away to confirm the reading, only 1 ppm was found. The remaining borings had readings ranging up to 5.3 ppm. All readings were therefore below the MPCA's action levels for soil cleanup of 10 ppm for fuel oil contamination and 40 ppm for gasoline contamination.

The above results corroborate those of previous investigations and confirm that VOC contamination is not a problem at this site. Additionally, since no VOCs were detected above the bedrock surface, fuel oil evidently is not present on top of the bedrock, as is the case for portions of the Depot site to the south.

2. Semivolatile Organic Compounds

Concentrations for those SVOC compounds found at or above detection limits is presented in Table 4. Of the 65 SVOC compounds analyzed for in this method, 17 were detected at varying levels in the fill. Fourteen of these were PAHs and represented the majority of the SVOC contamination found. The other three compounds detected were dibenzofuran (maximum of 0.57 mg/kg), di-n-butylphthalate (maximum of 17 mg/kg), and bis (2-ethyl hexyl) phthalate (maximum of 2.3 mg/kg). The two phthalates were also found in the quality control or blank samples and may be considered laboratory contaminants. They are commonly used in plastics (e.g., the plastic tubing used in laboratories) and often show up as laboratory contaminants. The levels of dibenzofuran found (in only two of the 12 fill samples) show it to not be a problem at the site also.

PAH compounds are typically present in coal tar and its derivatives, and can usually be found around asphalt road surfaces also. They are by-products of the destructive distillation of coal. They are considered insoluble in water, and several are known or suspected carcinogens.

As Table 4 shows, all of the composite fill samples had PAHs detected, with total PAHs (sum of the concentrations) ranging from 1 mg/kg (ppm) to 147 mg/kg. Total carcinogenic PAHs (based on MPCA's list of carcinogenic PAHs) found in the fill samples ranged from none in B-11 (MW-1) to 53 mg/kg in B-6. Figure 7 shows the distribution of total PAHs found. The highest concentrations were found in proximity to the railroad ROW (i.e., B-5, B-6, B-8, and B-9), with concentrations generally declining away from it.

The native soils underlying the fill had no PAHs detected, with the exception of the sample from B-6, which showed total PAHs of 10 mg/kg (carcinogenic PAHs totaled 1 mg/kg). The fill overlying the sample had the highest PAH levels, and it is possible that the sample was contaminated by slough falling into the borehole from above before the sample was taken. In any case, the native soil appears to not be contaminated with PAHs. This is consistent with

results of past investigations, and to the insoluble nature of PAHs in water. Additionally, the asphalt surface and position of the fill above the water table makes significant leaching of the fill into the subsurface unlikely.

3. Metals

The parameter list for metals analyses included eight common metals (from the RCRA regulations) -- arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver-- and boron. Boron was chosen for analyses since it is usually present in coal ash. The analyses are summarized in Table 5.

Since metals are naturally occurring and thus present everywhere, only those metals present above "normal" limits are considered a problem. Therefore, results from the laboratory analyses were compared to the common range of values for metals given in the MPCA document, "Site Response Soil Cleanup Procedures," (Warner, 1992). This comparison gives a broad view of how metal concentrations for the fill material relate to those in urban Minnesota or eastern U.S. soils. Table 5 lists the range of concentrations typically found.

In the native soil, none of the nine metals was outside the normal range. In the fill only boron showed levels outside the observed normal range; this would be expected for coal ash.

Since the lead concentrations were relatively high in three of the fill samples (B-2, B-9, and B-12), TCLP (Toxic Characteristics Leach Procedure) testing for lead was done. Results from the TCLP analyses are included in Appendix B. Of these samples, only B-2 (0.2 mg/l) was above the 0.1 mg/l detection limit, but far below the regulatory level of 5 mg/l. Therefore, it was concluded, based on these tests plus the concentrations of the other substances found, that none of the fill could be classified as hazardous waste.

4. Proposed Action Levels

Lots 17 and 18 are currently capped by an asphalt cover, which precludes human health risks from dermal contact, soil ingestion, and dust inhalation. Since the subsurface contamination is virtually restricted to the fill, and there are no apparent groundwater impacts (see Section B below), the site currently poses no significant health risks. However, if the asphalt cap is removed or breached, then the exposed fill would present health risks.

For PAHs, the MPCA has applied a level of 10 mg/kg for the summation of all PAHs as the action level for cleanup at other sites. The MPCA has also developed a model for vertical transport through the soil column as an alternative means for determining cleanup levels on a site-specific basis.

The Minnesota Department of Health has established soil exposure guidelines for lead of 300 ug/kg for residential settings and 500 mg/kg for certain other settings.

For other metals for which relevant toxicological data were available, proposed action levels were calculated based on soil ingestion by children, assumed to be the critical exposure pathway for this site given the adjacent residential use. The proposed action levels for most of the chemicals were calculated based on MPCA's "Procedures for Establishing Soil Cleanup Levels" (Warner, 1992), and the results given in Appendix D. The mercury level of 7 mg/kg is based on an MPCA guideline for the maximum cumulative land application of sewage sludge contaminated with heavy metals (Warner, May 1992; Exhibit C-1). The summary of results are included as Table 6.

Of the metals listed in Table 6, lead has a maximum concentration on the site that exceed its action level. If the site is not to be restricted from residential development, then remedial action would be necessary for at least a portion of the fill. If, on the other hand, future residential development is to be excluded, then remedial actions per se might not be required. In this case, the Department of Health's higher soil exposure guideline for lead (500 mg/kg)

may apply; this happens to equal the maximum lead concentration found on-site. Finally, it is emphasized once again that the site does not pose significant health risks under its current asphalt-capped condition.

B. LABORATORY RESULTS FOR GROUNDWATER SAMPLE

One groundwater sample from MW-1 was analyzed for the Priority Pollutant list as described in Section III. All of the 127 compounds and elements were below their respective detection limit except for zinc (0.20 mg/l), which was well below the RAL of 5 mg/l. Bis (2-ethyl hexyl) phthalate was also found at 36 μg/l, but was considered a laboratory contaminant by the laboratory as it was also found in the method blank. Complete results are given in Appendix C.

Section VII
Conclusions and Recommendations

A. CONCLUSIONS

The following conclusions can be drawn from the soil and groundwater investigation at Lots 17 and 18 of the former Milwaukee Road Depot:

1. The site is underlain by 3 to 9 feet of fill, which is largely composed of coal ash, sand, and some construction debris. Excluding the railroad right-of-way (which was not investigated), approximately 18,000 cubic yards of fill exists on Lots 17 and 18.

2. The native soils underlying the fill consist of up to 16 feet of sand underlain at some locations by up to 8 feet of clay. The uppermost bedrock is the Platteville limestone, found at a depth of 10 to 27 feet below grade.

3. Groundwater is encountered within the bedrock below the site, but not within the overlying unconsolidated sediments.

4. The groundwater beneath the site is evidently uncontaminated, based on a monitoring well sample analyzed for the EPA's Priority Pollutant list.

5. No fuel-oil or other petroleum-product contamination was found in the subsurface of the site. Also, no significant volatile organic compound concentrations were detected as evidenced by jar headspace screening with an organic vapor monitor.

6. Polynuclear aromatic hydrocarbons (PAHs) occur throughout the fill material on the site at levels that might pose a human health concern if the site were developed residentially. Fill samples from the 12 borings across the site contained PAHs at total concentrations ranging from 1 to 147 milligrams per kilogram (mg/kg). Total carcinogenic PAHs ranged from not detected in one sample to a maximum of 53 mg/kg.

7. The PAHs have not migrated significantly into the underlying soils. This is consistent with the presence of the asphalt cover, the unsaturated conditions above the bedrock, and the chemical characteristics of PAHs. PAHs were detected in the native soils in only one of the 12 soil borings (at 10 mg/kg for total PAHs and 1 mg/kg for carcinogenic PAHs), and this sample may have been cross-contaminated from the overlying fill during its recovery. PAHs were not detected in the native soils of the other 11 borings.

8. The heavy metal lead occurs at one location in the fill at a level that would be of concern if the site were developed residentially, based on the Minnesota Department of Health's Soil Exposure Guideline. However, TCLP (Toxic Characteristics Leach Procedure) analyses for lead indicated that the fill would not be classified as hazardous waste.

9. Elevated levels of boron also occur in the fill. However, the concentrations are well below the proposed action level.

10. If the site were to be fully remediated to allow unrestricted development, then based on the extremely high adsorptivity and low solubility of PAHs the most feasible procedure would be to excavate the fill and haul it to an appropriately permitted landfill.

11. The site does not pose a significant human health risk under its current asphalt-capped condition.

B. RECOMMENDATIONS

In light of the findings and conclusions of this study, the following recommendations concerning Lots 17 and 18 are made:

1. If the site continues to be used as a parking lot or for similar purposes, maintain the asphalt pavement or other impervious cover, repairing as necessary, to ensure the continued absence of human health risk.

2. If the site is to be developed for other purposes, ensure that requirements imposed by the Minnesota Pollution Control Agency are satisfied. The cost of hauling excavated fill and disposing it in a local landfill south of the Twin Cities would be approximately $75 per cubic yard (see Appendix E).

Section VIII
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Tables

TABLE 1

Previous Soil Boring and Analytical Data

Milwaukee Road Depot Lots 17 and 18

Boring/Trench Identification	Date of Installation	Depth (feet)	Results
B-3 (Lot 18)	1986	28.5	Bedrock at Elev. 802.8'
B-4 (Lot 17)	1986	28	Bedrock at Elev. 797.6'
1, 2, and 3 (Lot 18)	1989	7	Composite Sample 1'-3' Total PAHs 31.82 mg/kg No VOCs, PCBs, or Phenolics Detected Composite Sample 5'-7' Total PAHs 11.03 mg/kg No VOCs, PCBs, or Phenolics Detected
4 and 5 (Lot 17)	1989	7	Composite Sample 1'-3' Total PAHs 296 mg/kg No VOCs, PCBs, or Phenolics Detected Composite Sample 5'-7' PAHs Not Detected No VOCs, PCBs, or Phenolics Detected
A-1 (Lot 18)	1990	29	Bedrock at Elev. 804' No Petroleum Odor Reported 4 Feet of Fill Groundwater Not Encountered
A-2 (Lot 17)	1990	20.5	Bedrock at Elev. 806' No Petroleum Odor Reported 13 Feet of Fill Groundwater Not Encountered
B (Lot 17)	1990	21.5	Bedrock at Elev. 804' Slight Petroleum Odor Reported - 2 to 3 ppm VOCs 9 Feet of Fill Groundwater Not Encountered

TABLE 1, (Cont.)

Previous Soil Boring and Analytical Data

Milwaukee Road Depot Lots 17 and 18

Boring/Trench Identification	Date of Installation	Depth (feet)	Results
Trench 1 (Lot 18)	1990	6	Composite Sample 2'-6' PAHs Not Detected No VOCs Found (with HNu) Black Fill to 6'
Trench 2 (Lot 17)	1990	6	Composite Sample 2'-6' Total PAHs 2.14 mg/kg No VOCs Found (with HNu) Coal Ash/Clinker and Black Fill to 3'
Trench 3 (Lot 17)	1990	6	Composite Sample 2'-6' Total PAHs 2.81 mg/kg No VOCs Found (with HNu) Coal Ash/Clinker Fill to 3'-4' Discrete Sample 2'-4' Total PAHs 5.98 mg/kg No VOCs Found (with HNu) Discrete Sample 4'-6' PAHs Not Detected No VOCs Found (with HNu) Native Sand

Sources: For 1986 data, Braun, October 1986; for 1989 data, PACE, July 1989; for 1990 data, PACE, February 1991.

TABLE 2

Soil Boring Program

Milwaukee Road Depot Lots 17 and 18

Boring	Depth of Boring	Sampling Depths	
		Fill Composite	Native Discrete
	(ft)	(ft)	(ft)
B-1	9	0-5	8
B-2a	10	0-5	8
B-2b	13	None	None
B-3	9	0-3	8
B-4	27	0-5	8
B-5	7	0-3	6
B-6	7	0-3	6.5
B-7a	7	0-3	6
B-7b	2	None	None
B-8	7	0-5	6
B-9	22.5	0-9	10
B-10	11	0-9	11
B-11 (MW-1)	41.5	0-7	10
B-12	9	1-3	5

TABLE 3

Analytical Parameter List for Soil Samples

Milwaukee Road Depot Lots 17 and 18

Metals

Arsenic
Barium
Boron
Cadmium
Chromium
Lead
Mercury
Selenium
Silver

Semivolatiles

Phenol
bis(2-Chloroethyl)ether
2-Chlorophenol
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Benzyl alcohol
1,2-Dichlorobenzene
2-Methylphenol
bis(2-Chloroisopropyl)ether
4-Methylphenol
N-Nitroso-di-n-propylamine
Hexachloroethane
Nitrobenzene
Isophorone
2-Nitrophenol
2,4-Dimethylphenol
Benzoic acid
bis(2-Chloroethoxy)methane
2,4-Dichlorophenol
1,2,4-Trichlorobenzene
Naphthalene
4-Chloroaniline
Hexachlorobutadiene
4-Chloro-3-methylphenol
2-Methylnaphthalene
Hexachlorocyclopentadiene
2,4,6-Trichlorophenol
2,4,5-Trichlorophenol
2-Chloronaphthalene
2-Nitroaniline
Dimethylphthalate
Acenaphthylene
2,6-Dinitrotoluene
3-Nitroaniline
Acenaphthene
2,4-Dinitrophenol
4-Nitrophenol
Dibenzofuran
2,4-Dinitrotoluene
Diethylphthalate
4-Chlorophenyl-phenylether
Fluorene
4-Nitroaniline
4,6-Dinitro-2-methylphenol
N-Nitrosodiphenylamine
4-Bromophenyl-phenylether
Hexachlorobenzene
Pentachlorophenol
Phenanthrene
Anthracene
Di-n-butylphthalate
Fluoroanthene
Pyrene
Butylbenzylphthalate
3,3-Dichlorobenzidine
Benzo(a)anthracene
Chrysene
bis(2-Ethylhexyl)phthalate
Di-n-octylphthalate
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Indeno(1,2,3-c,d)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene

TABLE 4
Analytical Results for Semivolatiles Detected in Soils
Milwaukee Road Depot Lots 17 and 18
All units mg/kg

Soil Boring	B-1			B-2		B-3		B-4			B-5		B-6	
Depth (feet)	0-5	0-5 Dup**	8	0-5	8	0-3	8	0-3	0-3 dup	8	0-3	6	0-3	7
CARCINOGENIC PAHs														
Benzo(a)anthracene	1.3	BEQL<0.33	<0.33	1.8	<0.33	0.54	<0.33	1.7	1.4	<0.33	9.1	<0.33	10	1.0
Benzo(b)fluoranthene	1.4	0.5	<0.33	2.2	<0.33	0.58	<0.33	1.9	1.7	<0.33	6.0	<0.33	12	<0.99
Benzo(k)fluoranthene	0.83	0.5	<0.33	1.3	<0.33	0.57	<0.33	1.9	1.0	<0.33	7.1	<0.33	9.2	<0.99
Benzo(a)pyrene	1.1	0.6	<0.33	1.8	<0.33	0.59	<0.33	1.8	1.4	<0.33	5.3	<0.33	13	<0.99
Dibenz(a,h)anthracene	<0.33	BEQL<0.33	<0.33	0.49	<0.33	<0.33	<0.33	0.63	0.49	<0.33	<3.3	<0.33	<3.3	<0.99
Indeno(1,2,3-c,d)pyrene	0.61	0.4	<0.33	1.2	<0.33	0.57	<0.33	1.3	1.1	<0.33	<3.3	<0.33	8.4	<0.99
Total Carcinogenic PAHs	5	2		9		3		9			28		53	1
NON-CARCINOGENIC PAHs														
Phenanthrene	1.8	0.95	<0.33	2.1	<0.33	0.67	<0.33	1.4	1.0	<0.33	20	<0.33	11	2.3
Chrysene	1.5	0.6	<0.33	2.3	<0.33	0.77	<0.33	2.2	1.8	<0.33	10	<0.33	14	1.3
Anthracene	0.42	BEQL<0.33	<0.33	0.57	<0.33	<0.33	<0.33	0.36	<0.33	<0.33	5.0	<0.33	<3.3	<0.99
Fluoranthene	1.7	2.0	<0.33	2.0	<0.33	0.66	<0.33	2.4	1.6	<0.33	21	<0.33	19	2.5
Pyrene	2.3	1.5	<0.33	3.4	<0.33	0.94	<0.33	4.4	2.6	<0.33	24	<0.33	35	3.0
Benzo(g,h,i)perylene	0.94	BEQL<0.33	<0.33	2.1	<0.33	0.76	<0.33	1.6	1.3	<0.33	3.5	<0.33	15	<0.99
Naphthalene	<0.33	BEQL<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<3.3	<0.33	<3.3	<0.99
2-Methylnaphthalene	<0.33	0.37	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<3.3	<0.33	<3.3	<0.99
Total PAHs	14	7		22		7		22	15		111		147	10
OTHER COMPOUNDS														
Dibenzofuran	<0.33	BEQL<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<3.3	<0.33	<3.3	<0.99
bis(2-Ethylhexyl)phthalate	<0.33	BEQL<0.7	<0.33	0.34	<0.33	<0.33	<0.33	<0.33	<0.33	1.5	<3.3	<0.33	<3.3	<0.99
di-n-Butylphthalate	*1.0	<0.5	*0.77	*4.9	*4.6	*2.4	*4.7	*0.85	*17	*6.7	*7.7	*2.3	<3.3	*1.3

NOTES:
- \- All samples analyzed by Spectrum Labs unless otherwise noted
- * - Laboratory contaminant
- ** - Analyzed by Aspen Research Corporation
- BEQL - Below estimated quantitation limit

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TABLE 4 (cont.)
Analytical Results for Semivolatiles Detected in Soils
Milwaukee Road Depot Lots 17 and 18

All units mg/kg

Soil Boring	B-7		B-8		B-9		B-10		B-11		B-12	
Depth (feet)	0-2.5	6	0-4	6	0-8	10	0-5	11	0-7	11	1-3	4
CARCINOGENIC PAHs												
Benzo(a)anthracene	1.2	<0.33	1.3	<0.33	3.4	<0.33	1.9	<0.33	<0.33	<0.33	2.4	<0.33
Benzo(b)fluoranthene	1.1	<0.33	1.4	<0.33	5.0	<0.33	2.4	<0.33	<0.33	<0.33	4.3	<0.33
Benzo(k)fluoranthene	1.0	<0.33	1.4	<0.33	4.5	<0.33	2.4	<0.33	<0.33	<0.33	1.8	<0.33
Benzo(a)pyrene	<0.33	<0.33	1.4	<0.33	5.2	<0.33	2.2	<0.33	<0.33	<0.33	2.6	<0.33
Dibenz(a,h)anthracene	<0.33	<0.33	<0.33	<0.33	1.4	<0.33	<0.33	<0.33	<0.33	<0.33	1.1	<0.33
Indeno(1,2,3-c,d)pyrene	<0.33	<0.33	0.87	<0.33	2.8	<0.33	1.0	<0.33	<0.33	<0.33	1.8	<0.33
Total Carcinogenic PAHs	3		6		22		10		0		14	
NON-CARCINOGENIC PAHs												
Phenanthrene	2.4	<0.33	0.7	<0.33	3.6	<0.33	1.7	<0.33	0.39	<0.33	3.0	<0.33
Chrysene	2.1	<0.33	1.9	<0.33	4.2	<0.33	2.4	<0.33	0.35	<0.33	3.4	<0.33
Anthracene	0.81	<0.33	<0.33	<0.33	0.91	<0.33	0.45	<0.33	<0.33	<0.33	0.7	<0.33
Fluoranthene	1.6	<0.33	0.95	<0.33	3.8	<0.33	1.7	<0.33	<0.33	<0.33	2.3	<0.33
Pyrene	2.9	<0.33	2.6	<0.33	6.2	<0.33	5.3	<0.33	0.43	<0.33	4.6	<0.33
Benzo(g,h,i)perylene	<0.33	<0.33	1.5	<0.33	3.8	<0.33	1.6	<0.33	<0.33	<0.33	2.4	<0.33
Naphthalene	0.52	<0.33	<0.33	<0.33	0.76	<0.33	<0.33	<0.33	<0.33	<0.33	0.68	<0.33
2-Methylnaphthalene	0.48	<0.33	<0.33	<0.33	0.89	<0.33	<0.33	<0.33	<0.33	<0.33	0.87	<0.33
Total PAHs	14		14		47		23		1		32	
OTHER COMPOUNDS												
Dibenzofuran	<0.33	<0.33	<0.33	<0.33	0.57	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Ethyl hexyl)phthalate	<0.33	2.3	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
di-n-Butylphthalate	*11	<0.33	*0.74	*1.4	*1.5	*3.5	*1.0	*4.1	*9.6	*8.3	*2.9	*2.0

NOTES:
- All samples analyzed by Spectrum Labs unless otherwise noted
- * - Laboratory contaminant
- ** - Analyzed by Aspen Research Corporation
- BEQL - Below estimated quantitation limit

TABLE 5
Analytical Results for Metals in Soils
Milwaukee Road Depot Lots 17 and 18
All units mg/kg

Soil boring	Comparative soil data*	B-1			B-2		B-3		B-4			B-5	
Sample depth (feet)	Range	0-5	0-5 Dup**	8	0-5	8	0-3	8	0-3	0-3 Dup	8	0-3	6
Arsenic	<0.1 - 97	1.6	2.6	<1.0	2.2	<1.0	1.0	<1.0	1.1	<1.0	<1.0	1.8	<1.0
Barium	10 - 5,000	78	71	44	160	21	81	29	42	44	20	86	12
Boron	<0.06 - 8.47	13	12	0.8	0.8	1.4	2.6	<0.4	2.7	2.6	0.8	1.2	0.6
Cadmium	0.08 - 3.57	0.8	1.4	<0.4	1.4	<0.4	0.6	<0.4	<0.4	<0.4	<0.4	0.8	<0.4
Chromium	<0.05 - 64.12	13	8.6	4.2	17	3.4	8.1	9.2	9.8	15	8.2	14	5.4
Lead	<1.5 - 1,377	56	44	<3.0	160	<3.0	49	3.6	31	36	3.4	6.9	3.4
Mercury	<0.01 - 4.6	0.074	0.089	<0.050	0.12	<0.050	<0.050	<0.050	0.15	0.15	<0.050	<0.050	<0.050
Selenium	<0.1 - 4.3	<2.0	BPQL<0.26	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Silver	--	<1.0	BPQL<1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES:
- All samples analyzed by Spectrum Labs unless otherwise noted.
- * - From MPCA Office Memorandum (Warner, May 1992); boron, cadmium, chromium and lead data represent "front yard" sample sites in Minnesota; other data represent samples throughout the conterminus U.S. (Shacklette and Boerngen, 1984).
- ** - Analyzed by Aspen Research Corporation.
- BPQL - Below practical quantitation limit.

TABLE 5 (cont.)
Analytical Results for Metals in Soils
Milwaukee Road Depot Lots 17 and 18

All units mg/kg

Soil boring	Comparative soil data*	B-6		B-7		B-8		B-9		B-10		B-11		B-12	
Sample depth (feet)		0-3	7	0-2.5	6	0-4	6	0-8	10	0-5	11	0-7	11	1-3	4
	Range														
Arsenic	<0.1 - 97	1.2	<1.0	2.4	<1.0	2.8	<1.0	4.7	<1.0	1.8	<1.0	3.4	<1.0	6.1	<1.0
Barium	10 - 5,000	130	35	54	8.6	51	13	120	9.9	67	17	210	12	120	9.9
Boron	<0.06 - 8.47	2.6	0.6	3.4	0.6	3.6	1.2	28	1.8	5.0	1.4	49	1.2	13	1.0
Cadmium	0.08 - 3.57	0.4	<0.4	0.4	<0.4	<0.4	<0.4	1.8	<0.4	0.6	<0.4	1.4	<0.4	0.8	<0.4
Chromium	<0.05 - 64.12	12	23	20	7.8	11	3.2	16	7.2	11	5.0	15	5.2	30	5.0
Lead	<1.5 - 1,377	64	8.5	84	<3.0	78	<3.0	200	<3.0	77	3.4	88	<3.0	500	<3.0
Mercury	<0.01 - 4.6	0.051	<0.050	0.060	<0.050	0.17	<0.050	0.089	<0.050	0.063	<0.050	<0.050	<0.050	0.070	<0.050
Selenium	<0.1 - 4.3	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Silver	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES: - All samples analyzed by Spectrum Labs unless otherwise noted.

* - From MPCA Office Memorandum (Warner, May 1992); boron, cadmium, chromium and lead data represent "front yard" sample sites in Minnesota; other data represent samples throughout the conterminus U.S. (Shacklette and Boerngen, 1984).

BPQL - Below practical quantitation limit.

TABLE 6

Maximum Site Concentrations and Proposed Action Levels for Metals

Milwaukee Road Depot Lots 17 and 18

(Units mg/kg)

Constituent	Maximum Site Concentration	Proposed Action Levels
Arsenic	6.1	15
Barium	210	1050
Boron	49	1350
Cadmium	1.8	7.5
Chromium	30	75
Lead	500	300*
Mercury	0.17	7**
Selenium	ND	75
Silver	ND	75

Notes:

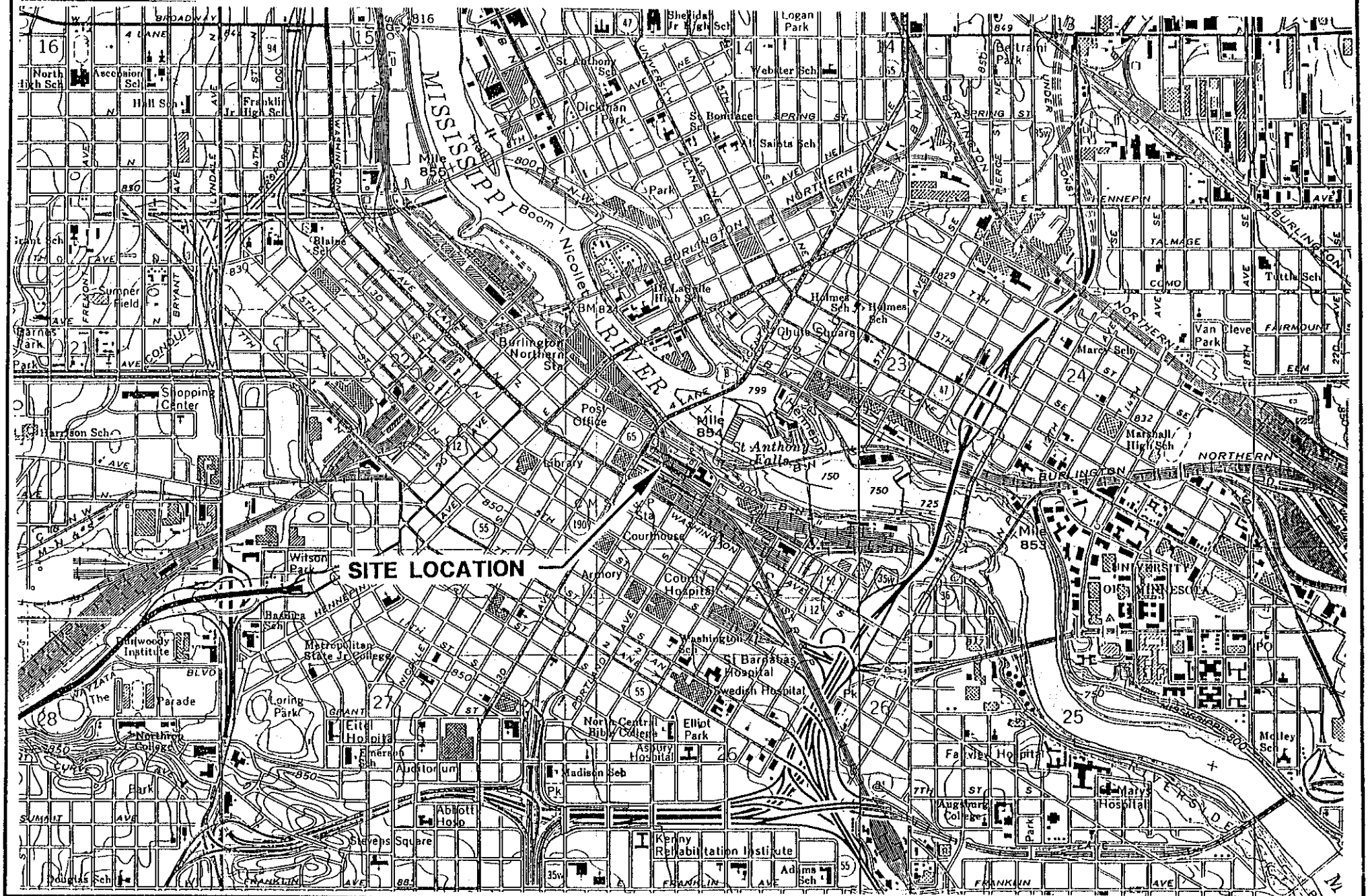
- See Appendix D for calculations of proposed action levels, except for lead and mercury (noted below). Included in table are these constituents for which pertinent toxicological data were available.

ND - Not Detected.

* - Established by the Minnesota Department of Health.

** - Warner (May 28, 1992), Exhibit C-1.

Figures



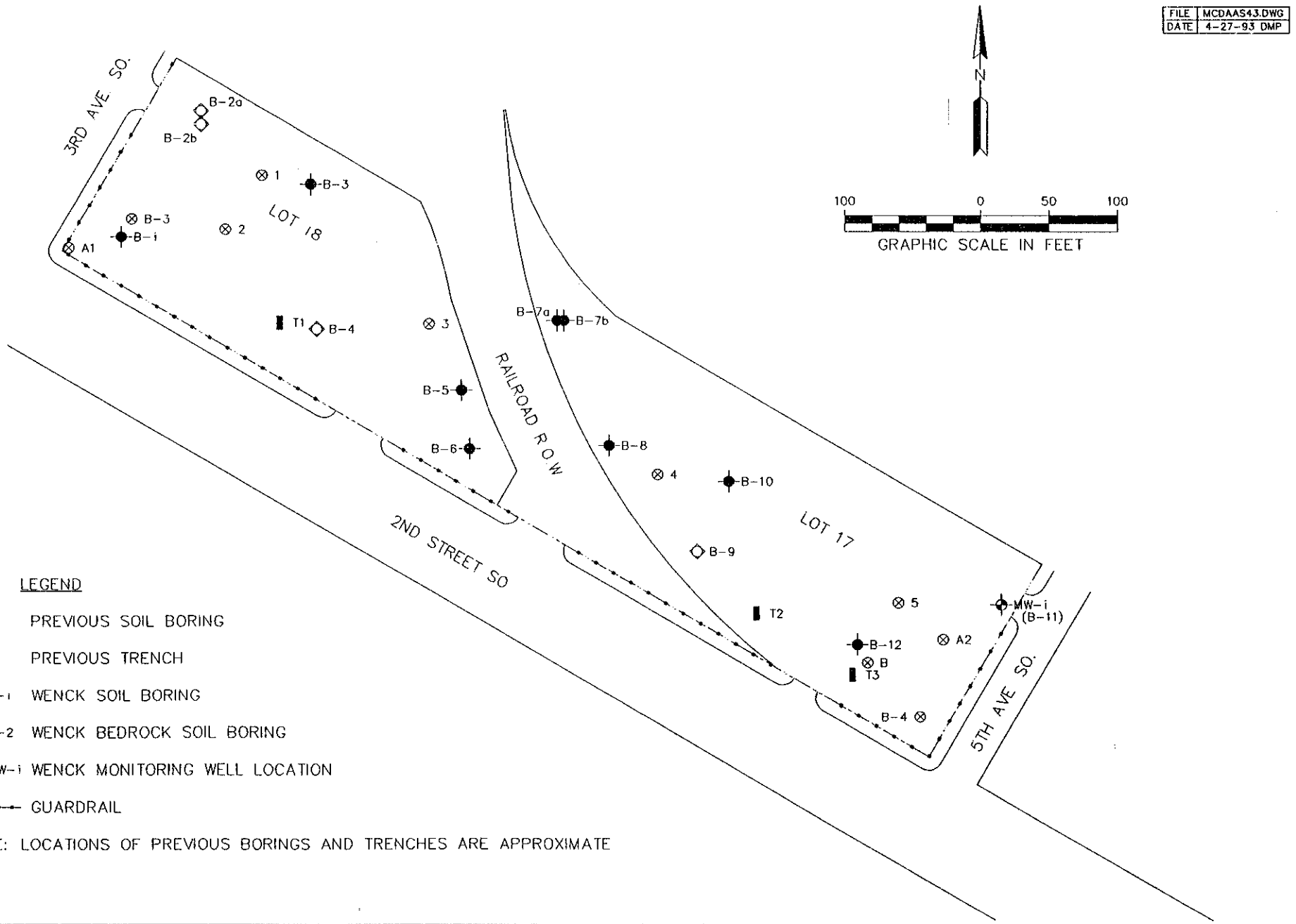
MCDA - Milwaukee Road Depot Lots 17 and 18

Location Map

Wenck
Wenck Associates, Inc. 1800 Pioneer Creek Ctr.
Environmental Engineers Maple Plain, MN 55359

May 1993

Figure 1



MCDA - Milwaukee Road Depot Lots 17 and 18

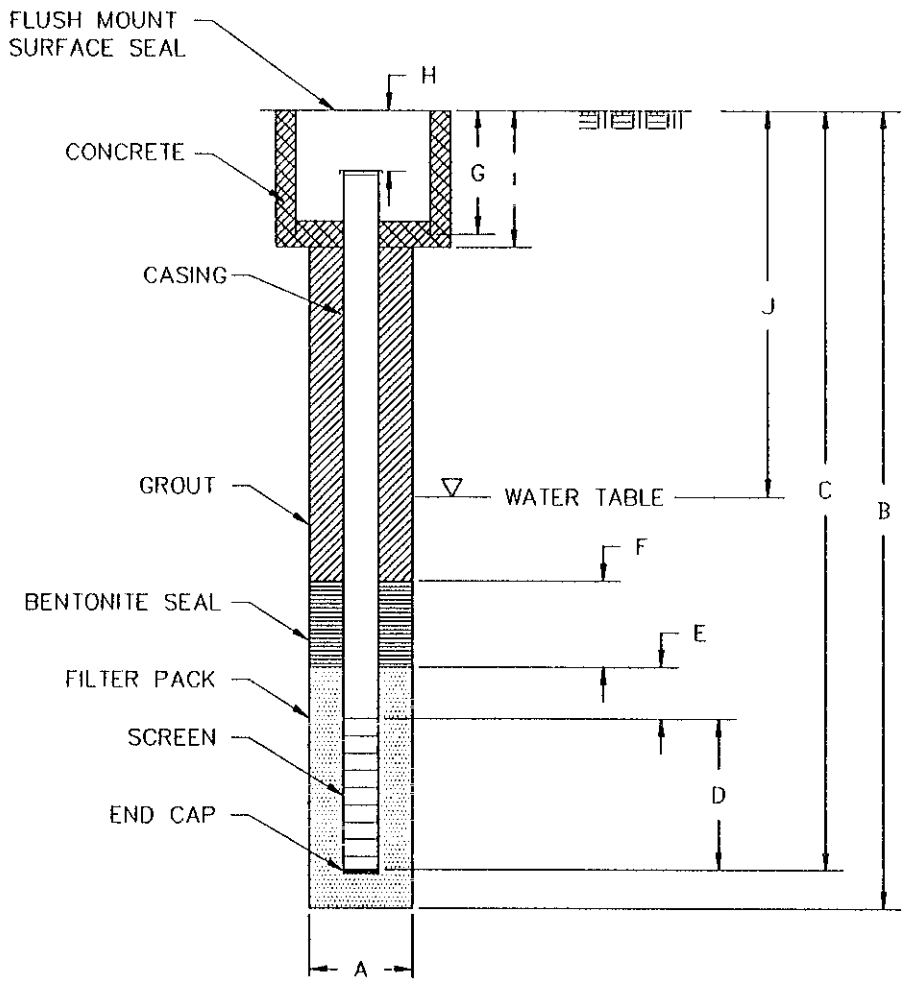
Site Map

Wenck

Wenck Associates, Inc. 1800 Pioneer Creek Ctr.
Environmental Engineers Maple Plain, MN 55359

May 1993

Figure 2



BOREHOLE INFORMATION

A	BOREHOLE DIAMETER	6 INCHES
B	BOREHOLE DEPTH	41.5 FEET
C	WELL DEPTH	40.8 FEET

SCREEN INFORMATION

D	SCREEN LENGTH	10 FEET
–	SCREEN DIAMETER	2 INCH
–	SLOT SIZE	0.010 INCH
–	MATERIAL	STAINLESS STEEL
–	SCREENED INTERVAL	30.5 TO 40.5 FEET

FILTER PACK INFORMATION

E	DIST. ABOVE SCREEN	0.85 FEET
–	FILTER PACK MATERIAL	#30 FLINT SAND

SEAL INFORMATION

F	SEAL THICKNESS	2.5 FEET
–	SEAL MATERIAL	BENTONITE PELLETS

SURFACE SEAL INFORMATION

G	SEAL DEPTH	12 INCHES
–	SEAL DIAMETER	8 INCHES
–	CASING MATERIAL	STEEL
H	CASING DEPTH	1 INCH
I	SURFACE EXCAVATION	18 INCHES

OTHER INFORMATION

–	GROUT MATERIAL	NEAT CEMENT
–	SURFACE SEAL	CONCRETE
–	DRILLING METHOD	HOLLOW STEM AUGER
–	DRILLER	EXPLORATION TECHNOLOGY
–	CASING ELEVATION	EL. 824.24
J	DEPTH TO WATER	APPROXIMATELY 32.6 FEET
–	DATE DRILLED	2-23-93
–	PROJECT NAME	MILWAUKEE ROAD (MCDA)
–	LOCATION	LOT 17

FILE	MCW133.DWG
DATE	3-26-93 DMP

MCDA - Milwaukee Road Depot Lots 17 and 18

Monitoring Well Schematic (MW -1)

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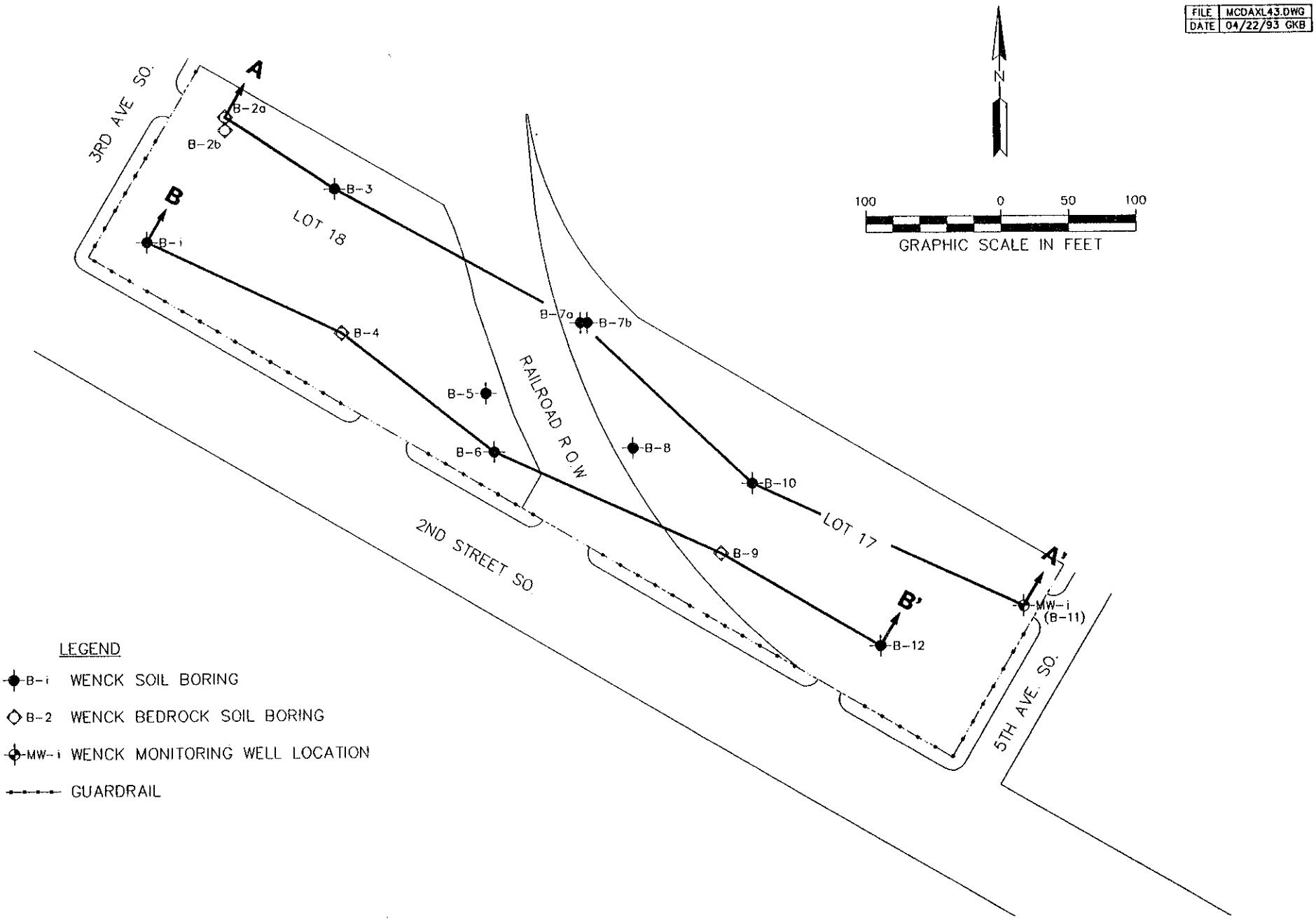
Figure 3



MCDA - Milwaukee Road Depot Lots 17 and 18

Cross Section Location Map

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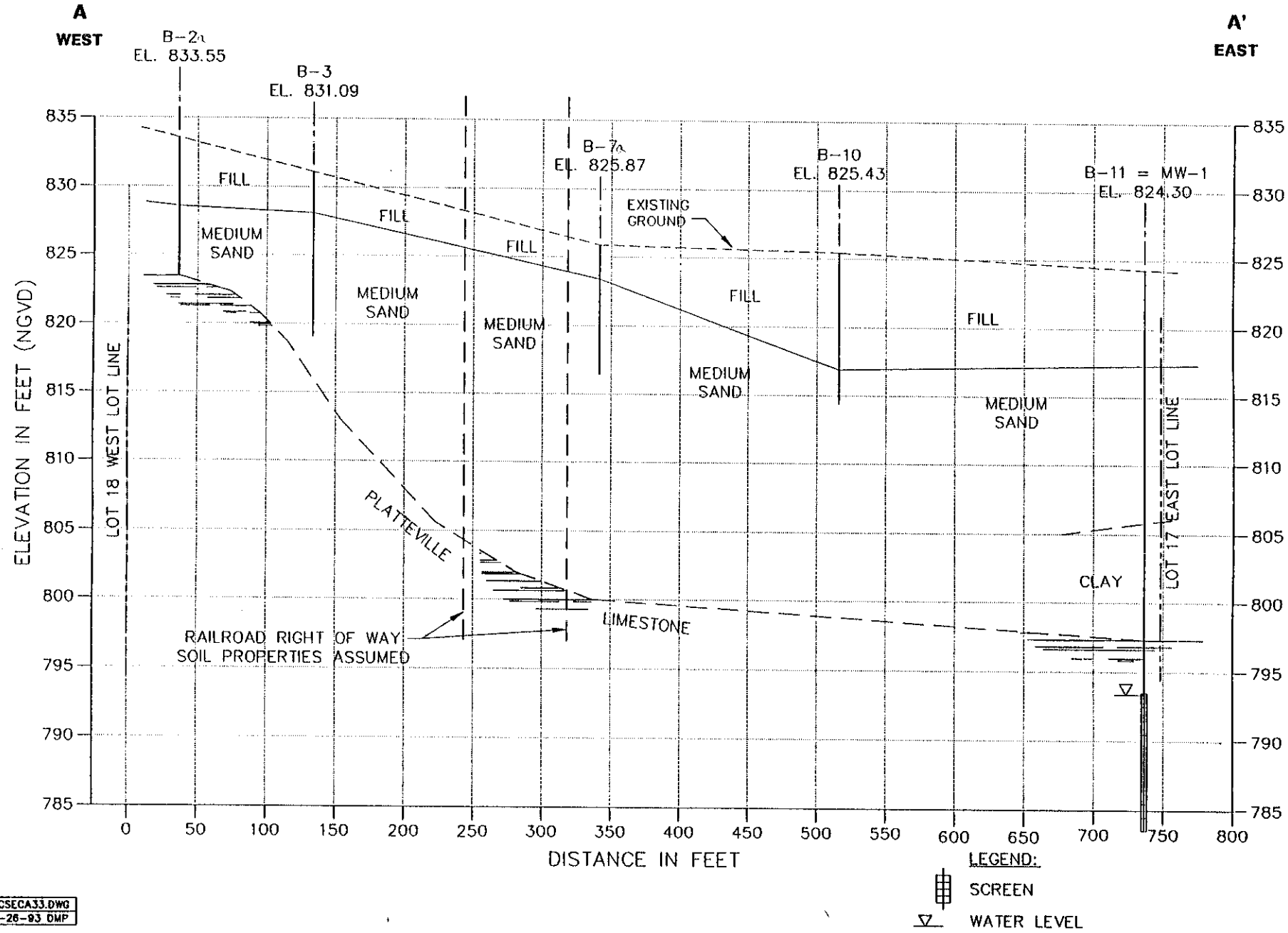
Figure 4



FILE	MCSECA33.DWG
DATE	3-26-93 DMP

MCDA - Milwaukee Road Depot Lots 17 and 18

Cross Section A - A'

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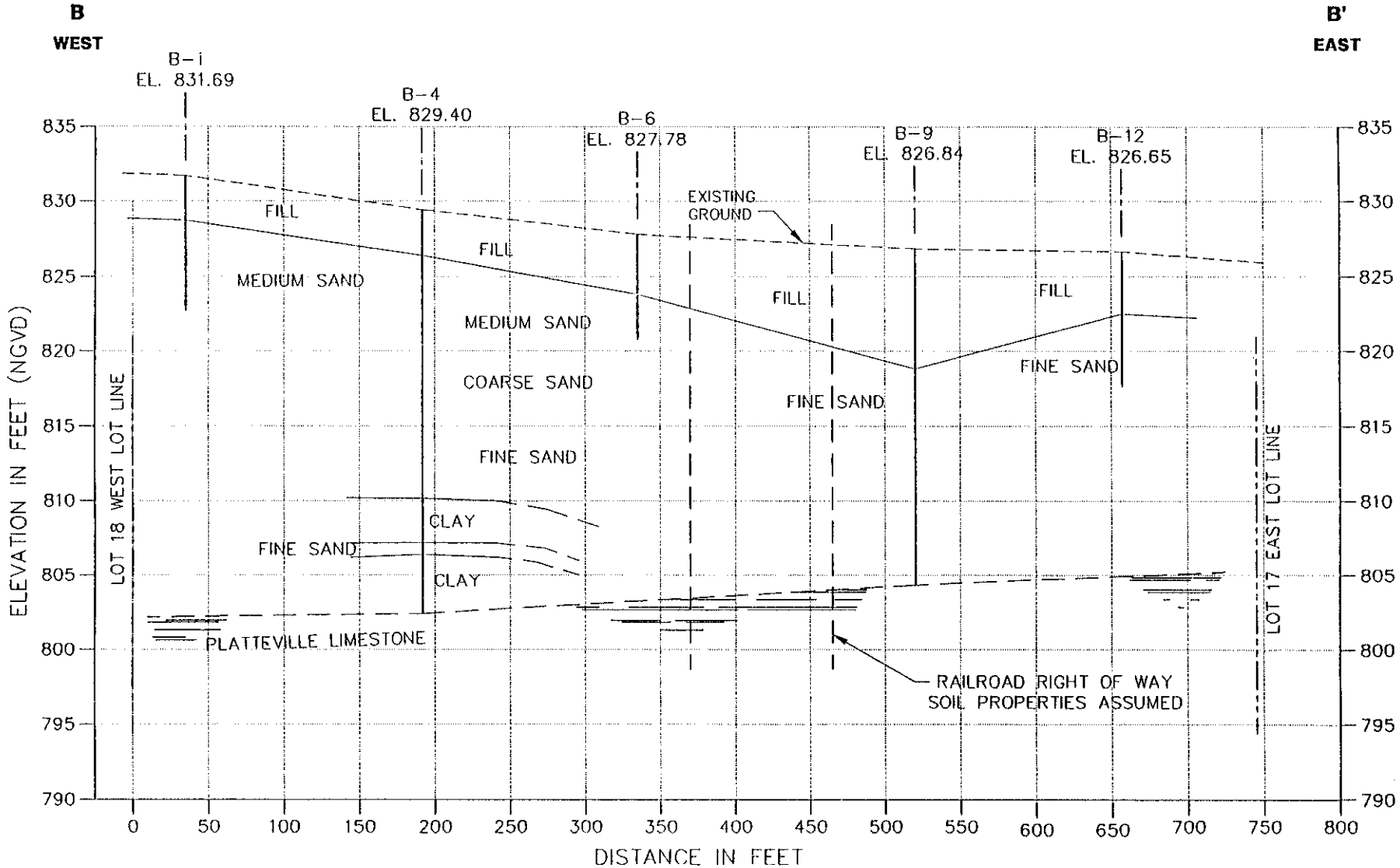
Figure 5



FILE	MCSECB33.DWG
DATE	3-26-93 DMP

MCDA - Milwaukee Road Depot Lots 17 and 18

Cross Section B - B'

Wenck

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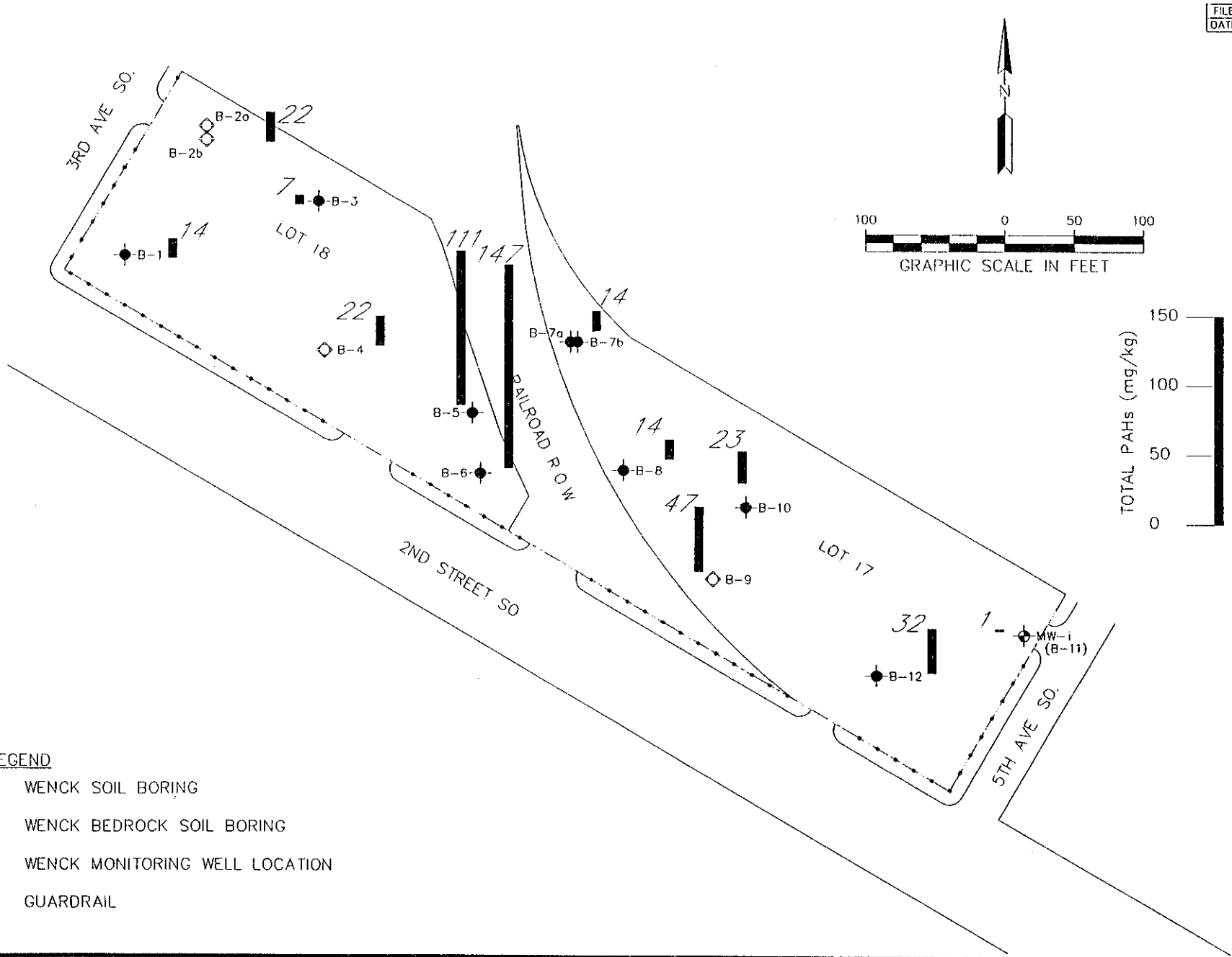
Figure 6



MCDA - Milwaukee Road Depot Lots 17 and 18

Areal Distribution of Total PAHs in Fill

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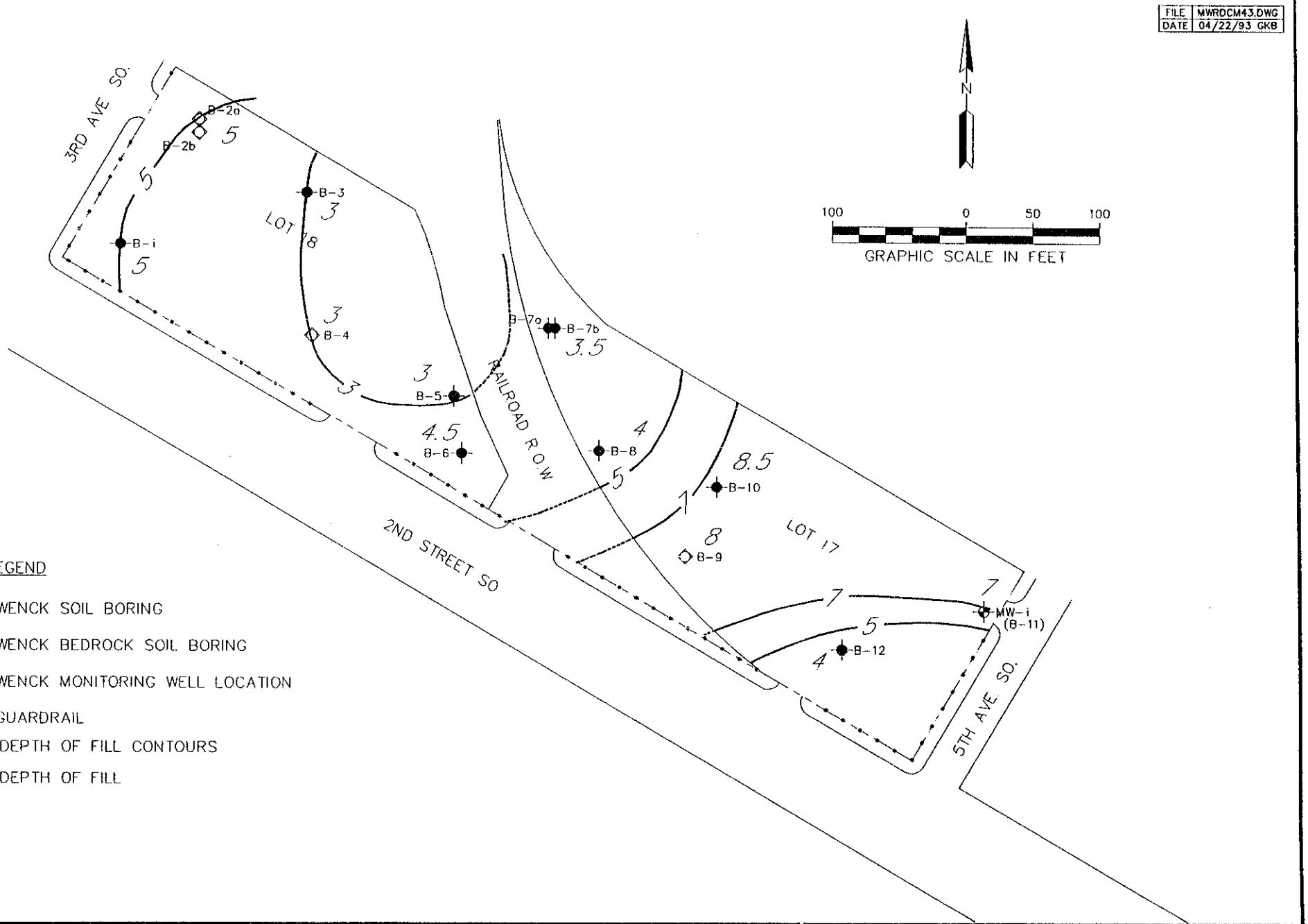
Figure 7



MCDA - Milwaukee Road Depot Lots 17 and 18

Depth of Fill Contour Map

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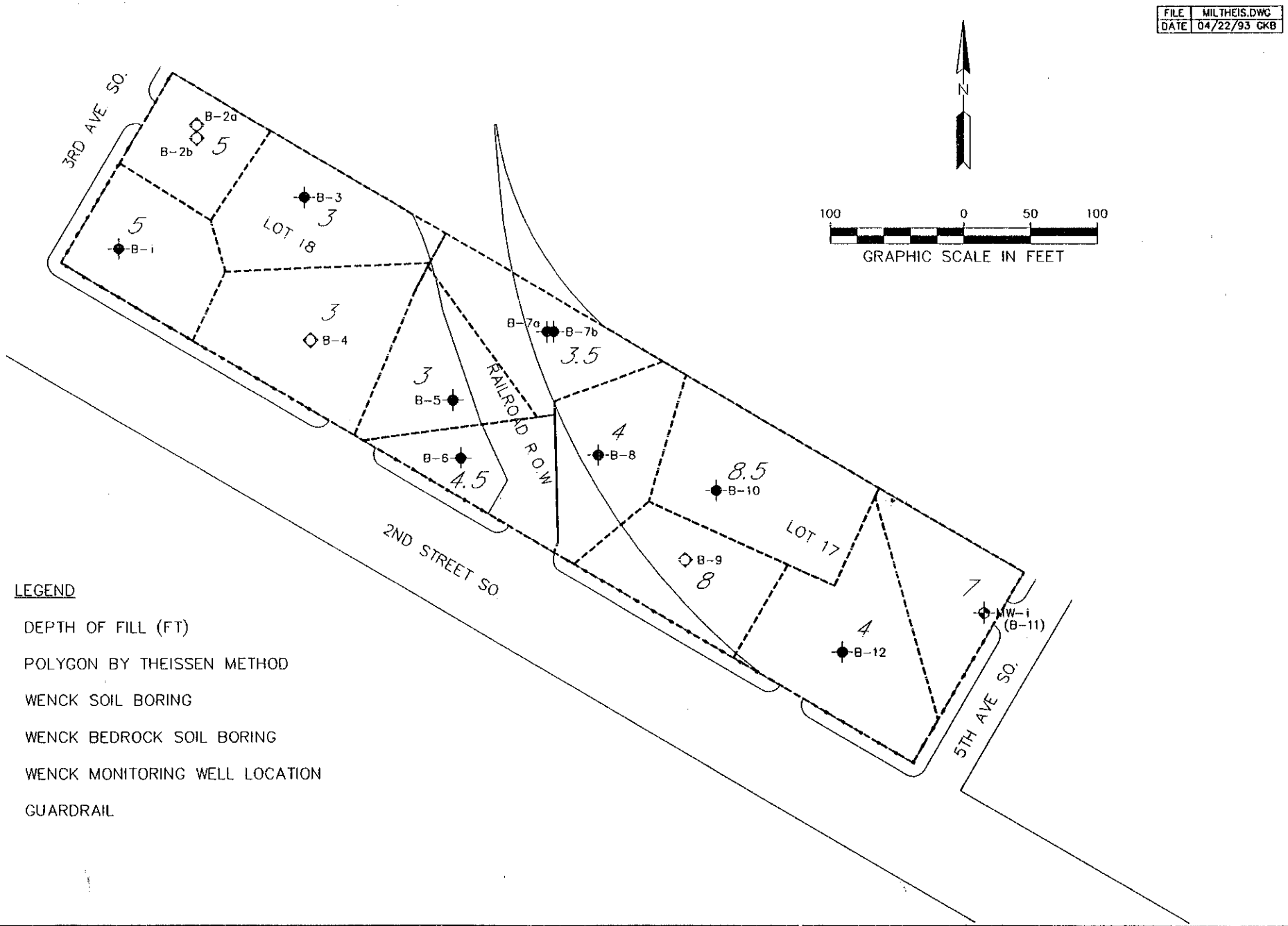
Figure 8



MCDA - Milwaukee Road Depot Lots 17 and 18

Theissen Diagram for Estimating Volume of Fill

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Figure 9

Appendix A

Soil Boring Logs

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-1

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 18

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 831 69	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
831.69		ASPHALT	00.0	HSA (C: M SV)	NA	NA
830.69		BLACK, COAL ASH FILL WITH BRICK DEBRIS SLIGHTLY MOIST INCREASING SAND CONTENT WITH DEPTH	1.0			5.3
829.69		BROWN, CLAYEY COAL ASH FILL WITH GRAVEL AND BRICK DEBRIS SMALL (1") PIECES OF RR TIE INCREASING SAND WITH DEPTH	2.0			0
828.69			3.0			
827.69	SP	BROWN MEDIUM DENSE MEDIUM TO COARSE SAND FILL WITH GRAVEL MOIST 1/2" BAND OF CLINKER FILL AT 4.0' 1/2" BAND OF CLINKER FILL AT 4.5'	4.0	SS (C: M SV)	10 12 12 14	0
826.69			5.0			
825.69	SP	LIGHT BROWN MEDIUM DENSE, FINE TO MEDIUM SAND MOIST	6.0	SS	12 13 15 15	0
824.69			7.0			
823.69			8.0	SS (D: M SV)	7 7 8 9	0
822.69		EOB @ 9'	9.0			

TOTAL DEPTH: 9 FT
DRILLING DATE: 2/25/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4" I.D HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET, HSA; 3-9 FEET 2" SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE
(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

FILE	MR08LB1.DWG
DATE	4-19-93 DMP

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-2a

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 18

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV. (FT)	USCS GROUP	GROUND SURFACE ELEV: 833.55	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
833.55		ASPHALT	00.0			
832.55		BLACK COAL ASH FILL WITH TRACE SAND DRY	1.0	HSA (C: M, SV)	NA	1.0
831.55			2.0			3.7
830.55		BLACK, MEDIUM DENSE SANDY COAL ASH FILL WITH GRAVEL, SLIGHTLY MOIST	3.0	SS (C: M SV)	8 8 10 12	0
828.55	ML	BROWN, CLAYEY SILT, MOIST	4.0 5.0			
827.55	SP	BROWN, MEDIUM DENSE, MEDIUM TO COARSE SAND, MOIST	6.0	SS	7 7 10 10	0
826.55		CHANGING TO FINE TO MEDIUM SAND	7.0			
825.55	SP	SMALL LAYERS OF DARK BROWN SAND	8.0	SS (D: M SV)	8 10 12 15	0
824.55	SP	BROWN MEDIUM DENSE COARSE SAND MOIST	9.0	NA	29	NA
823.55		EOB @ 10' BEDROCK (PLATTEVILLE LIMESTONE)	10.0			

TOTAL DEPTH: 10 FT
DRILLING DATE: 2/24/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4 I.D. HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET HSA; 3-10 FEET 2" SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE

(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

FILE | MRD8LB2.DWG
DATE | 4-19-93 DMP

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-2b

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 18

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 833.55	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
833.55			0.0			
832.55		SEE B-2a	1.0	NONE	NONE	NONE
831.55			2.0			
830.55			3.0			
829.55			4.0			
828.55			5.0			
827.55			6.0			
826.55			7.0			
825.55			8.0			
824.55			9.0			
823.55			10.0			
822.55			11.0			
821.55			12.0			
820.55		EOB @ 13 BEDROCK (PLATTEVILLE LIMESTONE)	13.0			

TOTAL DEPTH: 13 FT
DRILLING DATE: 2/24/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4" I.D. HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: NONE

FILE	NRDBLB2B.DWG
DATE	4-19-93 DMP

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-3

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 18

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 831 09	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
831 09		ASPHALT	00.0			NA
830 09		DARK BROWN TO BLACK, SANDY COAL ASH FILL, MOIST INCREASING SAND CONTENT WITH DEPTH	1.0	HSA (C: M, SV)	NA	0.4
829 09		DARK BROWN FINE SAND WITH COAL ASH FILL SLIGHTLY MOIST	2.0			0
828 09	ML	DARK BROWN MEDIUM DENSE, FINE SAND MOIST	3.0	SS	12 12 13 15	0
827 09			4.0			
826 09			5.0	SS	8 10 10 12	0
825 09			6.0			
824 09	SM	DARK BROWN, MEDIUM DENSE, SILTY SAND MOIST	7.0	SS (D: M SV)	8 8 9 10	NA
823 09	SW	DARK BROWN MEDIUM DENSE, COARSE SAND WITH PEBBLES MOIST	8.0			
822 09		EOB @ 9'	9.0			

TOTAL DEPTH: 9 FT
DRILLING DATE: 2/25/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4 I.D HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET HSA; 3-9 FEET 2" SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE

(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

FILE	MRDBLB3.DWG
DATE	4-19-93 DMP

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-4

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 18

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 829 40	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
829.40		ASPHALT	00 0	HSA (C: M SV)	NA	37
		BLACK, COAL ASH FILL WITH BRICK DEBRIS, MOIST				
828.40			1.0			
		BROWN SANDY COAL ASH FILL MOIST				
827.40			2.0			NA
		BROWN MEDIUM SAND WITH SOME COAL ASH FILL. DRY SAND HAD OXIDIZED COATING				
826.40			3.0			
		DARK BROWN MEDIUM DENSE, MEDIUM SAND SLIGHTLY MOIST		SS (C: M SV)	12 12 13 15	0
825.40			4.0			
824.40	SP		5.0			
		COLOR CHANGING TO LIGHT BROWN MOISTURE INCREASING		SS	13 12 12 17	0
823.40			6.0			
822.40			7.0			
		BROWN MEDIUM DENSE, FINE TO MEDIUM SAND WITH TRACE COARSE SAND MOIST		SS (D: M SV)	7 7 7 8	0
821.40			8.0			
	SP	COARSENING DOWNWARD				
820.40			9.0	SS	9 8 9 9	0
819.40			10.0			
	SP	WHITE, VERY FINE SAND, MOIST				
818.40			11.0			
				SS	7 7 8 9	0
817.40			12.0			
		BROWN MEDIUM DENSE, COARSE SAND WITH GRAVEL MOIST CHANGING TO FINE TO MEDIUM SAND AT 12.5 FEET				
816.40	SW		13.0	SS	7 7 9 10	0
		CHANGING TO FINE SAND				
815.40			14.0			
814.40			15.0			
				SS	10 12 12 15	0
813.40			16.0			
812.40			17.0			
811.40		CONTINUED ON NEXT PAGE	18.0			

TOTAL DEPTH: 27 FT
DRILLING DATE: 2/19/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4 I.D. HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET HSA; 3-27 FEET 2" SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE
(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

FILE	MRDBLB4.DWG
DATE	4-19-93 DMP

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-4 (continued)

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 18

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 829.40	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
		FROM PREVIOUS PAGE	18.0	SS	10 10 12 12	0
810.40			19.0			
809.40	CL	GRAY. STIFF CLAY. MOIST	20.0	SS	10 10 10 11	0
808.40			21.0			
807.40	SP	BROWN. FINE CLEAN SAND	22.0	SS	11 13 13 16	NA
		LIMESTONE PIECES				
806.40	CL	GRAY VERY STIFF CLAY MOIST	23.0			
805.40		SATURATED LAYER @ 24.5 TO 25	24.0	SS	10 12 12 14	0
804.40			25.0			
803.40			26.0	SS	13 15 15 17	0
802.40		EOB @ 27 BEDROCK (PLATTEVILLE LIMESTONE)	27.0			

TOTAL DEPTH: 27 FT
DRILLING DATE: 2/19/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4" I.D. HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET HSA; 3-27 FEET 2" SPLIT-SPOON

FILE	MRDBLB48.DWG
DATE	5-21-93 RJM

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-5

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 18

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 828.34	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
828.34		ASPHALT	00.0			
		BLACK, COAL ASH FILL, MOIST				NA
827.34			1.0	HSA (C: M SV)	NA	
	SM	LIGHT BROWN SILTY SAND WITH TRACE COAL ASH FILL MOIST				1.4
826.34			2.0			0.9
825.34			3.0			
824.34	SM	LIGHT BROWN MEDIUM DENSE SILTY SAND MOIST	4.0	SS	7 10 10 12	0
823.34	SP	GOLDEN BROWN MEDIUM DENSE MEDIUM SAND MOIST	5.0			
822.34	SP	LIGHT BROWN MEDIUM DENSE FINE TO MEDIUM SAND MOIST	6.0	SS (D: M SV)	7 7 8 9	0
821.34		EOB @ 7'	7.0			

TOTAL DEPTH: 7 FT
DRILLING DATE: 2/19/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4 I.D. HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET HSA; 3-7 FEET 2" SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE

(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

FILE MRDBL35.DWG
DATE 4-19-93 DMP

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-6

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 18

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 827.78	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
827.78		ASPHALT	00.0	HSA (C: M SV)	NA	10
826.78		DARK BROWN. COAL ASH FILL. DRY, INCREASING AMOUNT OF SAND WITH DEPTH	1.0			24
825.78			2.0			17
824.78	SP	BROWN FINE SAND WITH TRACE FILL. TRACE GRAVEL, MOIST SAND HAD OXIDIZED COATING	3.0			
823.78			4.0	SS	14 18 18 16	0
822.78	SP	BROWN.MEDIUM DENSE FINE SAND MOIST	5.0			
821.78			6.0	SS (D: M. SV)	13 18 20 21	NA
820.78		EOB @ 7'	7.0			

TOTAL DEPTH: 7 FT
DRILLING DATE: 2/19/93
INSPECTOR: KENT TORVE
CONTRACTOR: MCDA
DRILLER: EXPLORATION TECHNOLOGY INC.

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4' I.D. HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET HSA; 3-7 FEET 2" SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE

(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

FILE	MRDBL86.DWG
DATE	4-19-93 DMP

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-7a

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 17

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV. (FT)	USCS GROUP	GROUND SURFACE ELEV: 825.87	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
825.87		ASPHALT	0.0 0	HSA (C: M SV)	NA	NA
824.87		DARK BROWN, FINE COAL ASH FILL, WITH SOME CLINKERS DRY	1.0			93
823.87		DARK BROWN FINE COAL ASH FILL SLIGHTLY MOIST	2.0			51
822.87	SP	BROWN FINE SAND, DRY	3.0	SS	12 12 13 16	0
821.87			4.0			
820.87	SP	BROWN MEDIUM DENSE MEDIUM TO COARSE SAND, SLIGHTLY MOIST	5.0	SS (D: M SV)	11 13 13 15	NA
819.78			6.0			
818.87		EOB @ 7'	7.0			

TOTAL DEPTH: 7 FT
DRILLING DATE: 2/19/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4" I.D. HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET, HSA; 3-7 FEET 2" SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE

(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

FILE	MRDBLB7.DWG
DATE	04/23/93 GKB

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-7b

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 17

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 825.87	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
825.87		ASPHALT	00.0	NONE	NA	NA
824.87		DARK BROWN, FINE COAL ASH FILL WITH SOME CLINKERS, DRY	1.0	HSA	NA	1.0 1.0 (Dup)
823.87		EOB @ 2'	2.0			

TOTAL DEPTH: 2 FT
DRILLING DATE: 2/19/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4' I.D HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: HSA

FILE	MRDBL87B.DWG
DATE	04/23/93 GKB

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-8

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 17

WENCK PROJ NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 826.21	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
826.21		ASPHALT	00.0			
		DARK BROWN COAL ASH FILL WITH TRACE CLINKER DRY				
825.21		BLACK COAL ASH FILL WITH BRICK DEBRIS MOIST	1.0	HSA (C: M SV)	NA	1 0
824.21		DARK BROWN TO BLACK, SANDY COAL ASH FILL WITH CINDERS AND DEBRIS	2.0			
823.21			3.0			
822.21			4.0	SS (C: M SV)	13 16 16 17	0 3*
821.21	SP	BROWN MEDIUM DENSE FINE SAND DRY	5.0			
820.21		BAND OF LIGHT BROWN SAND, WITH IRON STAINING	6.0	SS (D: M. SV)	17 17 18 20	NA
	SP	BROWN, DENSE, FINE SAND, DRY				
819.21		EOB @ 7'	7.0			

TOTAL DEPTH: 7 FT
DRILLING DATE: 2/19/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4" I.D HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET. HSA; 3-7 FEET 2' SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE
(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

* OVM ZEROES AT 0.3 PPM

FILE	MRDBLB8.DWG
DATE	4-8-93 RLB

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-9

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 17

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV. (FT)	USCS GROUP	GROUND SURFACE ELEV: 826 84	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
826.84		ASPHALT	00.0			
825.84		BLACK FINE COAL ASH FILL, TRACE SAND BRICK AND ASPHALT DEBRIS MOIST	1.0	HSA (C: M SV)	NA	1.9
824.84			2.0			0
823.84			3.0			
822.84		BROWNISH BLACK, FINE SANDY COAL ASH FILL, MOIST	4.0	SS (C: M SV)	10 12 9 10	0
821.84	SP	BROWN, MEDIUM DENSE, FINE SAND WITH TRACE COAL ASH FILL MOIST	5.0			
820.84			6.0	SS (C: M SV)	12 12 10 10	0
819.84		BROWNISH BLACK, FINE SANDY COAL ASH FILL MOIST	7.0			
818.84			8.0	SS (D: M SV)	3 3 4 4	NA
817.84			9.0			
816.84	SP	BROWN MEDIUM DENSE FINE SAND WITH TRACE QUARTZ MOIST	10.0	SS (D: M SV)	12 13 13 12	NA
815.84			11.0			
814.84		LIGHT BROWN, MEDIUM DENSE FINE SAND WITH TRACE QUARTZ, MOIST	12.0	SS	6 7 7 10	NA
813.84			13.0			
812.84	SP		14.0	SS	10 10 12 19	NA
811.84			15.0			
810.84			16.0	SS	7 10 15 19	NA
809.84		SMALL LIMESTONE PIECES, GRAY WITH IRON STAINING	17.0			
808.84	SP	LIGHT BROWN MEDIUM DENSE, VERY FINE SAND, MOIST	18.0	SS	12 12 17 23	NA
		CONTINUED ON NEXT PAGE				

TOTAL DEPTH: 22.5 FT
DRILLING DATE: 2/18/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4" I.D. HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET HSA; 3-22.5 FEET 2" SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE

(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

FILE | MRDBLB9.DWG
DATE | 4-19-93 DMP

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-9 (continued)

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 17

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 826.84	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
808.84		FROM PREVIOUS PAGE	18.0			
807.84			19.0			
806.84			20.0	SS	4 5 5 7	NA
805.54			21.0			
804.84	SP	WHITE MEDIUM DENSE FINE SAND MOIST	22.0	SS	7 8 8	NA
803.84		EOB @ 22.5 BEDROCK (PLATTEVILLE LIMESTONE)				

TOTAL DEPTH: 22.5 FT
DRILLING DATE: 2/19/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4" I.D HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET, HSA; 3-22.5 FEET 2" SPLIT-SPOON

FILE	MRDBLB98.DWG
DATE	5-21-93 RJM

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-10

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 17

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV. (FT)	USCS GROUP	GROUND SURFACE ELEV: 826.21	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
826.21		ASPHALT	0.0	HSA (C: M SV)	NA	45
825.21		BLACK FINE, COAL ASH FILL TRACE GRAVEL. TRACE BRICK TRACE CINDERS MOIST	1.0			NA
824.21		BLACK, FINE COAL ASH FILL WITH SOME SAND, TRACE GRAVEL TRACE BRICK TRACE CINDERS MOIST	2.0			0
823.21		BLACK, FINE, SANDY COAL ASH FILL, MOIST	3.0			
822.21	CL	BROWN STIFF SANDY CLAY TRACE COAL ASH FILL MOIST	4.0	SS (C: M SV)	5 5 5 5	0
821.21	SC	BROWN MEDIUM DENSE, CLAYEY SAND WITH SOME COAL ASH FILL MOIST	5.0			
820.21	SP	BROWN MEDIUM DENSE FINE TO MEDIUM SAND MOIST	6.0	SS	6 6 7 9	NA
819.21		BLACK TO BROWN SANDY COAL ASH FILL, MOIST	7.0			
818.21			8.0	SS (C: M SV)	3 5 7 9	0
817.21	SP	BROWN MEDIUM DENSE FINE TO MEDIUM SAND MOIST	9.0			
816.21	SW	VERY LIGHT BROWN MEDIUM DENSE MEDIUM TO COARSE SAND, MOIST	10.0	SS (D: M SV)	6 7 9 9	NA
815.21	SP	BROWN FINE TO MEDIUM SAND MOIST	11.0			
		EOB @ 11				

TOTAL DEPTH: 11 FT
DRILLING DATE: 2/18/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4 I.D HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET HSA; 3-11 FEET 2" SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE

(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

FILE	MRDBL10.DWG
DATE	5-21-93 RJM

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-11

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 17

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 824 30	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
824 30		ASPHALT	00.0	HSA (C: M. SV)	NA	47
823 30		BLACK COAL ASH FILL WITH CONCRETE AND ASPHALT DEBRIS MOIST	1.0			31
822 30		BROWN SANDY COAL ASH FILL WITH COARSE ALLUVIUM MOIST	2.0			
821 30			3.0	HSA (C: M. SV)	18 16 16 12	17
820 30			4.0			
819 30	OL	BROWNISH BLACK PEAT WITH COAL ASH FILL SLIGHTLY MOIST	5.0	SS (C: M SV)	11 4 4 5	NA
818 30			6.0			
817 30	CL	BLACK. VERY STIFF SILTY CLAY WITH SOME PEAT MOIST	7.0	SS	7 7 10 12	NA
816 30	SP	VERY FINE MEDIUM DENSE BROWN SAND VERY MOIST	8.0			
815 30	SP	GOLDEN BROWN MEDIUM SAND MOIST COARSENING DOWNWARD 1/2" BAND OF COARSE LAYER AT 10.5	9.0	SS (D: M SV)	7 10 10 11	0
814 30			10.0			
813 30	SP	LIGHT BROWN MEDIUM DENSE, FINE TO MEDIUM SAND MOIST	11.0	SS	8 8 12 12	0
812 30			12.0			
811 30	SP	GOLDEN BROWN. MEDIUM DENSE MEDIUM SAND. MOIST	13.0	SS	7 7 10 17	NA
810 30			14.0			
809 30	SP	LIGHT BROWN MEDIUM DENSE. FINE SAND MOIST	15.0	SS	7 10 12 13	0
808 30			16.0			
807 30			17.0	SS	12 12 13 15	0
806 30		CONTINUED ON NEXT PAGE	18.0			

TOTAL DEPTH: 41.5 FT
DRILLING DATE: 2/19/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC
DRILLER: GREG HANSON

WATER FIRST OBSERVED AT 40 FEET

DRILLING METHOD: 4 1/4" I.D. HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET. HSA; 3-27 FEET 2" SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE
(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

FILE	MRDBL11.DWG
DATE	5-21-93 RJM

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-11 (continued)

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 17

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 824 30	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
806 30		CONTINUED FROM PREVIOUS PAGE	18 0			
		GOLDEN BROWN, MEDIUM DENSE, COARSE SAND, MOIST				
805 30			19 0			
804 30			20 0	SS	8 12 9 16	0
	CL	GRAY VERY STIFF CLAY MOIST				
803 30			21 0			
802 30			22 0	SS	9 9 12 12	0
801 30			23 0			
800 30			24 0	SS	12 18	NA
799 30	SC	GRAY VERY STIFF SANDY CLAY MOIST	25 0			
798 30			26 0	SS	17 19 20	NA
797 30			27 0			
796 30			28 0	2-INCH CORE	RQD = 47%	NA
795 30			29 0			
796 30			30 0			
794 30		PLATTEVILLE LIMESTONE	31 0			
792 30			32 0			
791 30			33 0			
790 30			34 0	2-INCH CORE	RQD = 62%	NA
789 30			35 0			
788 30		CONTINUED ON NEXT PAGE	36 0			

TOTAL DEPTH: 41.5 FT
DRILLING DATE: 2/22/92
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC
DRILLER: GREG HANSON

WATER FIRST OBSERVED AT 40 FEET

DRILLING METHOD: 4 1/4 I.D HOLLOW STEM AUGER (HSA) 27-41.5 6' ROLLER BIT
SOIL SAMPLING METHOD: 0-3 FEET HSA; 3-27 FEET 2" SPLIT-SPOON

FILE	MRDBL11B.DWG
DATE	5-21-93 RJM

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-11 (continued)

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 17

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV. (FT)	USCS GROUP	GROUND SURFACE ELEV: 824.30	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	
788.30		CONTINUED FROM PREVIOUS PAGE	36.0			
787.30			37.0			
786.30		PLATTEVILLE LIMESTONE	38.0	NOT SAMPLED	NA	NA
785.30			39.0			
784.30			40.0			
783.30			41.0			
		EOB @ 41.5				

TOTAL DEPTH: 41.5 FT
DRILLING DATE: 2/22/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC.
DRILLER: GREG HANSON
DRILLING METHOD:
SOIL SAMPLING METHOD:

WATER FIRST OBSERVED AT 40 FEET

FILE	MRDBL11C.DWG
DATE	5-21-93 RJM

WENCK ASSOCIATES, INCORPORATED

LOG OF TEST BORING NO: B-12

PROJECT NAME: MILWAUKEE ROAD DEPOT
PROJECT LOCATION: LOT 17

WENCK PROJ. NO: 0044-12
CHECKED BY: KCT

SUBSURFACE PROFILE				SOIL SAMPLE DATA		
ELEV (FT)	USCS GROUP	GROUND SURFACE ELEV: 826.65	DEPTH (FT)	SAMPLE TYPE	BLOW COUNT	HEADSPACE RESULTS (ppm)
826.65		ASPHALT	0.0			
825.65		BLACK FINE COAL ASH FILL, TRACE CLINKERS WITH FINE SAND MOIST	1.0	HSA (C: M, SV)	NA	NA
824.65			2.0			
823.65			3.0			
822.65	SP	BROWN, MEDIUM DENSE, FINE SAND, MOIST	4.0	SS (D: M SV)	5 7 9 10	0
821.65			5.0			
820.65	SW	GRAY, MEDIUM DENSE FINE TO MEDIUM SAND MOIST	6.0	SS	10 12 12 16	2.8*
819.65			7.0			
818.65	SP	LIGHT BROWN WITH GRAY, MEDIUM DENSE FINE SAND MOIST	8.0	SS	7 7 4 5	2.8*
817.65			9.0			
816.65			10.0	SS	5 7 7 9	NA
815.65		EOB @ 11	11.0			

TOTAL DEPTH: 9 FT
DRILLING DATE: 2/18/93
INSPECTOR: KENT TORVE
CONTRACTOR: EXPLORATION TECHNOLOGY INC
DRILLER: GREG HANSON

NO WATER LEVEL OBSERVED

DRILLING METHOD: 4 1/4" I.D. HOLLOW STEM AUGER (HSA)
SOIL SAMPLING METHOD: 0-3 FEET HSA; 3-9 FEET 2" SPLIT-SPOON

(C:) COMPOSITE SAMPLE
(D:) DISCRETE SAMPLE
* OVM ZEROS AT 2.8 PPM

(M) METALS ANALYSES
(SV) SEMI-VOLATILE ANALYSES

FILE	MRDBLB12.DWG
DATE	5-21-93 RJM